

ducks used 10.4 times more energy in flight than at rest and used 1.8 times more energy in alert behavior or swimming than at rest, suggesting that human disturbance of wintering black ducks impaired their physiological condition, thereby reducing winter survival and/or nutrient reserves carried to the breeding grounds. Therefore, during migration stopovers, waterfowl must be afforded the time and opportunity to forage in high quality habitat to attain the desired body mass and fat depots, and replace lost energy reserves. To meet the metabolic demands of migration, waterfowl rely on many Federal, State, and private wetlands, including Prime Hook NWR, to rest, feed, and reacquire lost fatty deposits.

Molting: Feather molts are very costly from a metabolic standpoint, as waterfowl are converting from the alternate (summer) plumage to their basic (breeding) plumage. Most feathers are replaced during this period, as these birds are preparing for courtship rituals and pair bonding. Heitmeyer (1985) describes the prebasic molt of female mallards as extensive and intense, as these birds replace approximately 50 grams of feathers in a 6-7 week period, which requires a substantial amount of energy reserves. This increase in nutrient demand translates to the need for individual mallards to be afforded the opportunity for undisturbed foraging. Excess disturbance may negatively impact the ability of waterfowl to secure nutrients, thus disrupting molting processes and associated reproductive strategies.

Preening: Maintenance of feathers by preening has been previously correlated to molt activity and is undoubtedly influenced by molt chronology. Male mallards preen most often during autumn; but preening declines throughout early winter, which corresponds with declining molt activity (Combs 1987). Adverse impacts affecting preening activities would be similar to those associated with the molting process.

Resting: Resting appears to be a complementary activity to feeding, molting, and preening. As feeding declines from morning to afternoon, resting increases, which is necessary to allow birds to digest food consumed during previous periods of feeding (Paulus 1984b, Clark et al. 1986), and to rejuvenate muscle fibers that may have been damaged during periods of flight (McWilliams et al. 2004). The inability of waterfowl to rest may have a direct negative impact on the ability of waterfowl to digest foods and repair muscle fibers, thus impacting other necessary life history behaviors.

Waterfowl Sanctuaries

As discussed in the previous section, wintering waterfowl need access to areas that are free from human disturbance to complete seasonal and annual life cycle events. A disturbance can be characterized as an activity that causes an animal to deviate from behavior patterns that normally transpire without human influence. To explain further, a disturbance stimulus is produced when a human-related presence or object (e.g. birdwatcher; motorized vehicle) or sound (e.g. seismic blast or gunshot) occurs that causes changes to the natural behavioral patterns of animals (Frid and Dill 2002). Activities such as hiking, photography, jogging, hunting, fishing, boating, research and management activities, bicycling, and driving are among many types of disturbance that can and do occur on any National Wildlife Refuge. Because a disturbance free sanctuary is critical to waterfowl during the period of September 1 – March 15, it is important to understand that if unrestricted access is allowed to the entire refuge, the ability of the Prime Hook NWR sanctuary to meet the needs of waterfowl is reduced. The following sections discuss the values and functions of waterfowl sanctuaries and illustrate the impacts of disturbance on the ability of waterfowl to utilize habitats.

Disturbance is a primary factor influencing avoidance behaviors in waterfowl (Paulus 1984b, Heitmeyer 1985, Austin 1987) as ducks and geese are highly sensitive to motor traffic and human disturbance (walking, bird viewing, vehicular traffic) along roads during fall and winter (e.g., Bartelt 1987, Belanger and Bedard 1989, 1990, Bowles 1995, Dalhgren and Korschgen 1992, Gabrielson and Smith 1995, Heitmeyer 1985, Klein 1989, Knight and Cole 1991, 1995; Madsen 1985, Van Der Zande et al. 1980, Raasch 1996). Thus, when waterfowl are in areas adjacent to roads, they reduce time spent foraging and spend more time alert and vigilant to disturbance. For instance, a research study examining disturbance effects conducted on Mingo NWR in southeastern Missouri showed that mallards became alert at a mean distance of 213 meters (m), which is equivalent to 698 feet (ft), and flew from the site at a mean distance of 173 m (568 ft) in response to vehicle disturbance (Raasch 1996). In another study in Virginia, Pease, et al. (2005) described the responses of seven species of dabbling ducks to six different forms of disturbance and recorded whether the birds had: 1) no response; 2) alert response; 3) swam; and 4) flew. Analysis of the data from Virginia showed that 74.2 percent of birds responded (alert, swam, or flew) when birds were within 200 m (656 ft) of a human caused disturbance. As a result, when birds exhibit avoidance behaviors, swimming and flying activities increase while resting and feeding activities decrease (Combs 1987). This activity creates the need for additional foraging effort, which in turn influences seasonal movements and habitat selection. Areas that do not have regulations can cause increased human-wildlife interactions that can negatively affect the life history behaviors and metabolic processes of migratory waterfowl.

Laskowski et al. (1993) studied behavior of snowy egrets, female mallards, and greater yellowlegs on Back Bay NWR in Virginia within 91.4 meters of impoundment dikes used by the general public. The behavior of snowy egrets was recorded during August and September; mallards were monitored during migration in November and January; and greater yellowlegs behavior were observed during the northward shorebird migration. Researchers observed the behavior of birds during the typical public activities of walking, bicycling, and driving vehicles past the sample sites.

The study found that snowy egret resting behavior decreased and alert behavior increased in the presence of humans. Preening decreased when humans were present, but this change was not significant. Feeding, walk/swim, and flight behaviors were not related to human presence. Female mallards in November increased feeding, preening and alert behaviors in the presence of humans. Resting, walk/swim, and flight behavior were not influenced by human presence. In January, female mallard resting and preening behavior were not influenced by the presence of humans. However, feeding, alert, walk/swim, and flight behaviors were related to human presence. Greater yellowlegs increased alert behavior in the presence of humans. No other behaviors were affected. Maintenance behavior (combined feeding, resting, and preening) decreased when humans were present for all study species. In addition, this decrease was accompanied by an increase in escape behavior by each species. Maintenance behavior of mallards in January decreased in the presence of vehicles and combined disturbance. Escape behavior increased when vehicles or bicycles were present. Maintenance behavior of greater yellowlegs declined when bicycles and vehicles were present but was not influenced by pedestrian presence. Snowy egrets and female mallards increased movement between subplots and to areas within the study area but further from the disturbance.

The speed of vehicles has been identified as a factor that affects waterfowl response behavior. Objects that approach waterfowl quickly tend to frighten birds more often than objects that approach at lower speeds (Frid and Dill, 2002). Pease (2005), found that vehicles traveling more than 13 miles per hour but less than 30 miles per hour created the least amount of disturbance. As a contrast to speed, Pease noted that humans approaching waterfowl on foot had a greater disturbance impact than passing vehicles. Thus, research suggests that waterfowl are disturbed less by vehicles that pass at a moderate rate of speed, and more distressed by vehicles going very fast, very slow, or by humans on foot.

Non-motorized boating can affect refuge resources in a number of ways. Studies show that canoes and kayaks disturb wildlife (Bouffard 1982, Kaiser and Fritzell 1984 Knight 1984; Kahl 1991). The use of non-motorized boats can affect waterfowl broods, wintering waterfowl, shorebirds, raptors, and wading-birds. The low speeds associated with these boat types and their use primarily during the warmer months would mitigate those impacts, especially on wintering waterfowl and raptors. Canoeing/kayaking occur in areas frequented by shorebirds less often. Air thrust boats and jet skis are not permitted.

When birds leave the refuge because of human disturbance, high quality habitat is left unutilized for the duration of time that the birds are displaced. The length of time that a bird is displaced from a feeding site determines how much additional foraging effort will be required to replace lost food resources, which in turn impacts other maintenance activities such as molting, resting and preening. There are a number of research studies that examined how long it took waterfowl to return to habitats after being disturbed. For example, the return rate of mallards and Canada geese at Mingo NWR following vehicular disturbance indicated that two thirds of the birds were displaced after 25 minutes. At the Russell Lakes State Wildlife Area in Colorado, mallards flew from a pond during disturbances and did not return within 1 hour (George et al. 1991). In Wisconsin, only 15-56 percent of canvasbacks returned to foraging sites following disturbances (Kahl 1991), and staging snow geese populations in Quebec were found to be lower the day after they have been disturbed at a rate of less than two disturbances per hour, and that vehicular disturbance and unobstructed visual sight planes of approximately 400-500 m (1312 -1640 ft) are detrimental to waterfowl use and subsequent rates of return (Belanger and Bedard 1989). Thus, repeated disturbances (> 2 per hour), which could occur if unregulated access is permitted, can have serious detrimental impacts on the utilization of seasonal wetlands, which may ultimately cause birds to completely abandon a site, disperse to poorer quality habitat, and/or change feeding strategies.

Public use and access is important, but uses must be managed so that disturbance to wildlife is minimized and habitat utilization is not compromised. With these objectives in mind, it becomes necessary to recognize that disturbance to waterfowl early and late in the day can negatively impact biological processes such as feeding, flight, metabolic processes, molting, preening, and resting. For example, birds are feeding early in the morning

to obtain food resources, but are beginning to come to roost at sunset to begin a period of rest after returning from evening feeding. This period of rest is just as important as feeding because it permits the digestion of food prior to roosting and allows the repair of muscle fibers damaged during flight. Therefore, if measures to minimize or eliminate the cause of disturbance are not considered, the impacts from these activities can negatively affect the potential for wildlife to acquire the necessary resources needed to meet nutritional life history requirements throughout their annual life cycle (Raasch 1996, Fredrickson and Reid, 1988).

Providing waterfowl sanctuaries will minimize some of these impacts. Sanctuaries afford undisturbed access to waterfowl during biologically critical periods of the day. Havera et al. (1992) and Dahlgren (1988), in comprehensive literature reviews of human disturbances to migrating and wintering waterfowl, note that the use of sanctuaries (non-hunted areas) is the most common and effective solution to mitigating adverse disturbance impacts.

The use of sanctuaries as a management tool is an old concept. Bellrose (1954) wrote of the early 1900's when owners of duck lands found that providing non-hunted areas on their properties was of value in building and holding concentrations of waterfowl. A distinctive degree of sense of security constituted the principal factor governing duck use of areas that were all hunted, half hunted/half unhunted, or no hunting. Waterfowl numbers averaged 16 times more abundant per acre on half hunted/half unhunted areas than on areas that were completely hunted.

Other hunting measures that serve to mitigate adverse impacts to waterfowl:

- 1) provide adequate buffer areas and large enough sanctuaries to ensure full use by waterfowl;
- 2) provide “temporal respite” for ducks by limiting hunts to half days and/or use an intermittent hunt program (3-4 hunts/week); and
- 3) regulate hunter access limiting boat access and traffic to specific areas.

To minimize waterfowl disturbance, the refuge has designated approximately 3,000 acres as waterfowl sanctuaries. These areas will be closed to hunting and other recreational uses on a seasonal or annual basis. Given the dominant role of the refuge in the Atlantic Flyway migration corridor, this closed area system was established to provide waterfowl with a network of resting and feeding areas and to disperse waterfowl hunting opportunities on the refuge. These sanctuaries support policy 7 RM 3.6D. These sanctuaries lie in the Unit II (~1,800 acres) and the southern half of the Unit III (~970 acres) managed impoundments. The northern portion of Unit IV (~230 acres), which contains a proposed trail and observation platform, will be closed from the Monday before Thanksgiving to March 15 to also minimize disturbance to wildlife in this area. Waterfowl hunting will be terminated at noon in all hunting areas on limited hunting days to reduce disturbance to waterfowl feeding patterns, which in turn will result in high quality hunting experiences. Literature reviews of visitor use and its relationship to disturbance to waterbirds support the time restriction and are reflected in the hunting regulations of other refuges, particularly in the Southeast Region of the FWS (DeLong 2002).

Hunting is a priority, wildlife-dependent, consumptive activity with additional direct effects on waterfowl. General adverse impacts of waterfowl hunting are mortality, crippling and disturbance. Belanger and Bedard (1995) concluded that disturbance caused by waterfowl hunting to waterfowl resources can:

- 1) modify the distribution and use of habitats by waterfowl;
- 2) affect their activity budget and decrease their foraging time; and
- 3) disrupt pair and family bonds and contribute to increased hunting mortality.

The U.S. Fish and Wildlife Service annually prescribe frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow State selections of season and limits for recreation and sustenance; aid Federal, State, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with

population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which States may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Federal annual regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when “hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any bird, or any part, nest, or egg” of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to “the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the U.S. Fish and Wildlife Service as the lead federal agency for managing and conserving migratory birds in the United States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. Prime Hook NWR is in the Atlantic Flyway.

The process for adopting migratory game bird hunting regulations, located in 50 CFR part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on “early” and “late” hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g. dove, woodcock, etc.); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl season not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Though not as detailed as that for waterfowl, relevant data are collected and summarized for migratory bird species such as dove, woodcock, etc. Bird monitoring data are available through the Service’s Division of Migratory Bird Management Website (<http://www.fws.gov/migratorybirds/>; accessed February 2012).

Because the Service is required to take abundance of migratory birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, State and Provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, several factors are considered such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of State and Federal Governments. After Service establishment of final frameworks for hunting seasons, the States may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for National Wildlife Refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a National Wildlife Refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the State allows.

National Environmental Policy Act (NEPA) considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, “Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14),” filed with the Environmental Protection Agency on June 9, 1988. A Notice of Availability is published in the Federal Register on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA

considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment in which the FONSI is published generally in August of that hunt year. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53376); the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216). More information may be obtained from Chief, Division of Migratory Bird Management., US Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

At Prime Hook NWR, the impacts of hunting of waterfowl are negligible when compared to the State's total waterfowl harvest. For example, from 1987 to 2009, the average annual waterfowl harvest at the refuge is 2.6 percent of Delaware's total waterfowl harvest (Table 1.1). Furthermore, in 2009, the refuge's harvest of ducks was only 3.4 percent of Delaware's total duck harvest, 0.96 percent of the Atlantic Flyway's duck harvest, and 0.01 percent of the entire United States' duck harvest (Table 1.2; Raftovich et al. 2011). Also in 2009, the refuge's harvest of geese (Canada and snow geese combined) was only 0.82 percent of Delaware's total goose harvest, 0.04 percent of the Atlantic Flyway's goose harvest, and 0.01 percent of the entire United States' goose harvest. (Table 1.2; Raftovich et al. 2011).

The impacts of waterfowl hunting at the refuge are also negligible when compared to long-term trends in duck and goose populations at the refuge and across the state. Through monthly aerial surveys from October through November, the Delaware Division of Fish and Wildlife is able to evaluate long-term trends in duck and goose populations. The surveys give fairly accurate information about geese, but duck populations such as wood ducks and sea ducks are almost impossible to count. Furthermore, these surveys do not cover the entire state, but only the primary waterfowl habitat in Delaware, which is approximately the eastern half of the state. These figures represent the numbers of ducks and geese at the time of the survey, but do not reflect an actual annual estimate for the waterfowl population in Delaware due to the transitory nature of birds migrating through the State during the fall and winter months.

Based on the findings of these monthly surveys from 1987 to 2009, the average annual waterfowl harvest at the refuge is only 1.8 percent of the estimated peak waterfowl survey findings on the refuge (Table 1.1). During an individual season, the percent of the refuge's harvest on statewide and refuge populations may range greatly depending on the timing of refuge hunting activity and peak waterfowl migration. For example, during the 2009-2010 hunting season, the refuge harvested between 0.19 percent and 1.5 percent of the State's estimated monthly duck population and between 0.02 percent and 0.11 percent of the State's estimated monthly goose population (Table 1.3). Refuge hunters harvested between 0.31 percent and 6.15 percent of the refuge's estimated monthly duck population and between 0.09 percent and 1.48 percent of the refuge's estimated monthly goose population (Table 1.3).

Table 1.1. Waterfowl harvest and aerial survey estimates on Prime Hook NWR compared to statewide harvest. Waterfowl includes geese and ducks.

Year	Statewide Waterfowl Harvest*	Refuge Waterfowl Harvest	Refuge Waterfowl Survey**	Refuge Hunter Visits
1987	63,360	1,202	21,243	1,206
1988	62,160	771	21,814	826
1989	61,480	578	64,822	333
1990	59,510	1,241	49,611	1,065
1991	63,410	1,625	55,792	1,178
1992	46,600	1,155	55,238	1,291
1993	46,850	1,421	86,087	962
1994	53,290	2,053	155,096	1,604
1995	45,540	1,572	71,131	1,024
1996	44,170	1,980	104,447	1,630
1997	71,070	3,116	191,446	1,904

Year	Statewide Waterfowl Harvest*	Refuge Waterfowl Harvest	Refuge Waterfowl Survey**	Refuge Hunter Visits
1998	118,560	2,964	193,617	1,530
1999	96,410	1,987	224,693	1,403
2000	94,610	2,047	134,156	1,250
2001	76,210	2,679	107,919	1,683
2002	95,170	1,936	102,690	1,330
2003	88,800	2,546	203,615	1,486
2004	73,190	1,573	69,737	1,422
2005	71,740	1,624	111,544	1,301
2006	64,630	2,389	132,088	1,750
2007	81,620	2,989	44,086	1,850
2008	107,120	1,634	90,875	1,253
2009	86,600	1,934	79,263	1,453

*Statewide waterfowl harvest data from: <http://www.flyways.us/regulations-and-harvest/harvest-trends>

** Waterfowl estimates were derived from peak numbers found during aerial surveys. Zone 7 was used to estimate waterfowl numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. Only one survey was conducted in 2007 (October 2007) which may not have reflected the peak. (<http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20Surveys.aspx>)

Table 1.2. Comparison of waterfowl harvest at Prime Hook NWR to State, Flyway, and United States harvest in the 2009 hunting season.

Waterfowl Harvest Area	Ducks	Geese
Prime Hook NWR	1,609	325
Delaware*	46,800	39,800
Atlantic Flyway*	1,680,100	922,200
United States*	13,139,800	3,327,000

*Harvest estimates from (Raftovich et al. 2011)

Table 1.3. Comparison of duck and goose (Canada & snow geese) harvest at Prime Hook NWR to State waterfowl surveys during the 2009-2010 hunting season.

Month	Refuge Duck Harvest	Refuge Duck Population Estimates*	Statewide Duck Survey Results*	Refuge Goose Harvest	Refuge Goose Population Estimates*	Statewide Goose Survey Results*
Oct 2009	67	21,457	36,042	9	10,512	44,372
Nov 2009	406	30,548	63,516	104	18,734	92,604
Dec 2009	697	46,675	76,100	115	32,588	247,922
Jan 2010	439	7,141	28,688	97	6,565	102,229

* Waterfowl estimates were derived from peak numbers found during aerial surveys. Zone 7 was used to estimate waterfowl numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. (<http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20Surveys.aspx>)

Impacts of refuge hunting on snow geese and resident Canada geese are negligible. For resident Canada geese, hunters averaged 8.8 birds per year from 2001 to 2006 (Table 1.4). For snow geese in the late season (late January into March), hunters averaged 16.0 birds per year from 2001 to 2006 (Table 1.5). From 2000 to 2009,

refuge hunters harvested between 0.04 percent and 0.43 percent of the refuge's estimated monthly snow goose population (Table 1.5).

Table 1.4. Resident Canada Goose Harvest in Prime Hook National Wildlife Refuge.

Year	Resident Canada Goose Harvest	Refuge Hunter Visits
2001	14	33
2002	6	15
2003	10	13
2004	14	10
2005	0	0
2006	9	2

Table 1.5. Snow Goose Harvest and Aerial Survey Estimates at Prime Hook National Wildlife Refuge.

Year	Total Snow Goose Harvest*	Hunted in Late Season**	Snow Goose Harvested in Late Season**	Refuge Hunter Visits in Late Season**	Refuge Snow Goose Survey***
2000	174	No	n/a	n/a	96,112
2001	242	Yes	37	42	67,840
2002	48	Yes	7	9	72,200
2003	118	Yes	33	24	124,500
2004	121	Yes	3	5	55,330
2005	36	Yes	4	8	86,627
2006	73	Yes	12	12	132,088
2007	130	No	n/a	n/a	30,500
2008	56	No	n/a	n/a	84,520
2009	43	No	n/a	n/a	27,000

* Includes snow geese harvested in February / March when applicable

** Late season includes late January to mid-March

*** Snow goose estimates were derived from peak numbers found during aerial. Zone 7 was used to estimate snow goose numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. Only one survey was conducted in 2007 (October 2007) which may not have reflected the peak. (<http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20Surveys.aspx>)

Migratory bird hunters may also disturb migratory birds and other wildlife as they travel to and from their hunting sites or when retrieving downed birds. Depending on the location and the number/species of migratory birds in the area, a disturbance can be temporary with displaced birds moving to nearby backwaters, or major in the case of motoring through a large flock of snow geese. For some species like bald eagles and other predators, migratory bird hunting creates a readily available food source due to birds lost or wounded.

Direct disturbance to waterfowl occurs during white-tailed deer hunting seasons, as hunters flush deer through wetlands, creeks, and open water habitats. Dogs running at large during upland game hunting seasons will also flush wintering waterfowl resting and feeding in both wetland and upland areas. The ingestion of lead sinkers or lead shot is another concern; however, the impacts are lessened on refuge lands due to regulations requiring the use of non-toxic shot for upland hunting, except for slugs for deer hunting.

Expanded hunting opportunities for deer and waterfowl will cause disturbance to waterfowl in refuge impoundments, Prime Hook Creek, and refuge salt marshes. On Prime Hook Creek, deer hunting will occur on Tuesday, Thursday, and Friday during the hunting seasons. On refuge impoundments in Unit III and Prime Hook Creek, waterfowl hunting will occur on Monday, Wednesday, and Saturday during the hunting season. If the opening day of any duck season is Friday, waterfowl hunting will be open and deer hunting will not occur. Impacts to waterfowl will be decreased from current management by changing the end of shooting time from 3:00pm

to noon. Participating in the early teal, resident Canada goose, and snow goose conservation order will cause direct impacts to increase but will be negligible based on current refuge harvest contributions to statewide and national harvests. Free roam areas for deer and waterfowl hunting (jump shooting) will provide hunters greater access and also increase the potential for waterfowl disturbance. These disturbances are mitigated by creating sanctuary areas where no waterfowl hunting occurs.

Proposed waterfowl hunting in Units I and IV salt marshes have the potential to increase adverse impacts and disturbance on refuge wintering American black ducks. Zoned hunting areas have been established in Unit IV to limit hunter numbers, thereby minimizing wildlife disturbance. Since black ducks are a focal species of conservation concern, monitoring and the evaluation of impacts of increased recreational use of salt marsh habitats will be required to identify and respond to unacceptable impacts.

Impacts to Shorebirds

Disturbance to shorebirds has been well documented. Pfister et al. (1992) investigated human disturbance as a factor that might limit the capacity of appropriate staging areas to support migrating shorebirds. Results indicate that adverse impacts from human disturbance will be greater on shorebird species using the front side of beach habitats and that the local abundance of impacted species may be reduced by 50 percent. Such disturbance is implicated as a potential factor in long-term declines in shorebird abundance during migration periods at disturbed sites.

Disturbance to shorebirds becomes very crucial during incubation or nesting periods. Direct adverse impacts of displacement caused by human disturbance during nesting periods include egg exposure to temperature extremes, predation of eggs when the nest is vacated by the adult, and predation at a later time due to predators following human trail or scent (Korschgen and Dahlgren 1992). Protection of nesting colonial shorebirds is easier than protection of solitary nesters, like the American oystercatcher and piping plover, because much larger beach areas must be protected, managed, and patrolled. Public education, active protection methods (small fences around nests, signs, wardens), legal measures (beach use regulations, active enforcement patrols), and well-advertised closures of portions of the beach are management actions that often successfully reduce the adverse impacts of human disturbance when shorebirds are most vulnerable. Protection of nesting colonies using fences and wardens has markedly decreased reproductive losses of least tern colonies in New Jersey (Burger 1995).

Based on these findings and past observations of impacts on shorebirds by refuge staff, disturbance by refuge hunters to shorebirds is expected to be negligible since most shorebird species have completely passed through Delaware by peak hunting season in November through January. Some hunting occurs when these species may be migrating before and after this peak hunting time. Shorebirds using refuge marsh habitats that are also open to hunting may be disturbed by hunters traveling in these areas or by their gunshots; however, established sanctuaries provide disturbance-free areas for migrating birds during the hunting season.

A direct beneficial impact for shorebirds is derived from seasonal closures to hunting and other public use. Minimizing human disturbance will increase nesting and foraging opportunities on overwash habitats which will subsequently increase shorebird nesting productivity. Seasonal closures of designated beach dunes and overwash areas from March 1 through September 1 are in place to minimize disturbance to nesting shorebirds such as least terns, American oystercatchers, and, potentially, piping plovers.

Indirect beneficial impacts on shorebirds are obtained by educating hunters about special beach closures with news releases and other outreach mechanisms to engage the public to understand the needs of nesting shorebirds. Public awareness and appreciation of the refuge's efforts to conserve and protect shorebirds could inspire some to volunteer or support refuge needs in the conservation and protection of critical habitats required to protect continental and hemispheric shorebird resources in perpetuity in other ways.

Impacts to Landbirds

Disturbance to landbirds has been well documented. Pedestrian travel can influence normal behavioral activities, including feeding, reproductive, and social behavior and the location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al. 1998). For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion.

Some other species, such as wood thrush, will avoid areas frequented by people, such as developed trails and buildings, while other species, particularly highly social species such as tufted titmouse, Carolina chickadee, or Carolina wren, seem unaffected or even drawn to a human presence. When visitors approach too closely to nests, they may cause the adult bird to flush exposing the eggs to weather events or predators.

Disturbance to these non-hunted migratory birds could have regional, local, and flyway effects. Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc. We expect disturbance to non-hunted landbirds, such as feeding and resting, to increase due to an expected increase in deer hunters in new free roam hunting areas. However, the direct, indirect, and cumulative impacts of hunting on these non-hunted landbirds are expected to be negligible because the deer, upland game, and waterfowl hunting seasons are during the fall and winter months which do not coincide with the critical nesting periods of most bird species. Turkey hunting, which does occur during the nesting season of many non-hunted landbird species in April and May, is expected to have negligible impacts because hunter numbers are limited to less than five and are scattered over 3,472 acres.

Direct impacts to hunted landbirds such as quail, woodcock, and snipe are expected to remain stable since no increase in upland game hunting is expected. Hunting of resident game species such as quail does not have any regional impact on their respective populations due to their restricted home ranges. Delaware Division of Fish & Wildlife periodically reviews populations of all harvested resident species, and has determined that populations are adequate to support hunting efforts throughout the State. The refuge contributes negligibly to the State's total harvest for resident game species. For example, the number of quail taken per year has been no more than 14 per year on the refuge in recent years (Table 1.6).

Table 1.6. Number of upland game, small game, and webless migratory birds harvested and hunter visits on Prime Hook NWR.

Year	Dove Harvest	Snipe Harvest	Woodcock Harvest	Quail Harvest	Rabbit Harvest	Refuge Hunter Visits*
1996	110	0	0	5	83	126
1997	77	0	0	0	117	169
1998	30	0	0	0	46	112
1999	90	0	0	0	98	123
2000	13	0	0	0	29	81
2001	6	0	0	0	65	128
2002	58	0	0	0	163	114
2003	13	0	0	0	79	81
2004	12	0	0		75	53
2005	6	0	0	0	257	129
2006	20	0	0	14	115	106
2007	22	0	0	11	145	178
2008	0	0	1	10	176	171
2009	0	0	6	1	163	149

*Hunter visits include all species combined; majority are hunting rabbits

For migratory birds such as mourning dove, an estimated 36,300 birds were harvested in Delaware during the 2009 season (Table 1.6; Raftovich et al. 2011) when none were taken on the refuge. (Table 1.7). Similarly, very few snipe and woodcock were harvested (Table 1.7). Direct, indirect, and cumulative impacts on these species on the refuge are negligible. See [Impacts to Waterfowl](#) for a description of how the Federal and State migratory bird hunting frameworks are established.

Table 1.7. Comparison of mourning dove, woodcock, and snipe harvest at Prime Hook NWR to State, Flyway, and United States harvest in the 2009 hunting season.

Harvest Area	Dove	Woodcock	Snipe
Prime Hook NWR	0	6	0
Delaware*	36,300	200	0
Eastern Management Unit*	7,639,200	63,300	43,600
United States*	17,354,800	238,400	83,500

*Harvest estimates from (Raftovich et al. 2011); Estimates for snipe are from the Atlantic Flyway

Turkey hunting is proposed only if a huntable population is found to exist on the refuge. This will be determined through coordination with the Delaware Division of Fish & Wildlife. Currently, turkey hunting occurs in other areas of Delaware.

The hunting of deer can be a beneficial impact to landbirds. The reduction of the vegetation's physical structure and diversity due to overbrowsing by deer also can negatively impact landbirds. Casey and Hein (1983) have found greatly reduced bird species diversity in areas with long term, high density populations of deer. These changes were mainly attributed to habitual landscape alteration with pronounced browse line and sparse cover caused by overbrowsing.

Impacts on Secretive Marsh and Waterbirds

Resident waterbirds tend to be less sensitive to human disturbance than migrants, and thus will be less impacted by disturbance from public use on the refuge. However, wading birds have been found to be extremely sensitive to disturbance in the northeastern U.S. and may be adversely impacted by disturbance from public use on the refuge (Burger 1981). The impacts of intrusion through public use are generally negligible for this group of birds, but can vary by species and between years (Gutzwiller and Anderson 1999).

Disturbance to secretive marsh birds and waders from hunting would start in September and usually end in January, unless hunting is allowed during the snow goose conservation order into mid-April. This disturbance may have direct effects on migrating and wintering secretive marsh birds and waders. However, these birds would receive added benefits from the establishment of new sanctuary areas or zones, where 3,000 acres would be protected from hunting activities that cause disturbances to secretive marsh and waterbirds.

Impacts on Fisheries

Impacts to fisheries from visitors engaged in hunting are expected to be temporary and negligible. Increased deer and waterfowl hunting on Prime Hook Creek and Unit III impoundments will cause increased suspension of bottom sediments from boat motors. However, since hunting occurs during the fall and winter months, this sediment suspension should not adversely affect biological oxygen demand (BOD) for fisheries resources. Early season hunters may harm submerged or emergent vegetation by accessing small ditches, which may cause negligible adverse impacts to protective cover for fisheries based on past observations of these impacts from refuge staff. Effects on interjurisdictional fishes are expected to be unlikely from hunting because the majority of the refuge will experience minimal, transitory use by hunters.

Impacts on Mammals

In general, the presence of humans will disturb most mammals, which typically results in indirect negligible short-term adverse impacts without long-term effects on individuals and populations.

Adverse impacts on resident game populations from hunting would be negligible. The Delaware Division of Fish and Wildlife periodically reviews populations of all harvested resident species and has determined that populations are adequate to support hunting efforts throughout the State. Hunter visits and harvest of upland and small game such as rabbit on the refuge have been relatively low (Table 1.6) and impacts are expected to be negligible. The refuge does not allow hunting of eastern gray squirrel to minimize conflicts with endangered Delmarva fox squirrel.

Overall impacts from hunting on non-hunted mammals, such as voles, moles, mice, shrews, and bats, are expected to be negligible. Since small mammals are less active during winter when hunting season occurs, and since these species are mostly nocturnal, hunter interactions with small mammals are very rare. Vehicles are restricted to roads and harassment or taking of any wildlife other than legal game species is not permitted. Impacts of hunting to migratory bat species would be negligible. Except for some species of migratory bats, these species have very limited home ranges and hunting would not affect their populations regionally. These species are in torpor or have completely passed through Delaware by peak hunting season in November through January. Some hunting occurs during September-October and March-April when these species are migrating; however, hunter interaction would be commensurate with that of non-consumptive users.

The Delaware Division of Fish and Wildlife recently finalized a new statewide 10-year deer management plan (Rogerson 2010). The plan was created with input from a 22-member advisory group, a public phone attitude survey, a mail survey to hunters, comments solicited from the general public, and technical reviews from deer experts outside the division. The resulting plan identifies population objectives based on habitat capability and societal tolerances.

Prime Hook NWR is located in the State's deer management zone 9, which encompasses the northeastern coastal portion of Sussex County (Rogerson 2010). The Division of Fish and Wildlife manages deer populations, in part, through recreational hunting. Based on their monitoring programs, the Division of Fish and Wildlife adjusts hunting levels in terms of season length, sex ratio in the harvest, and number of hunters (tag availability) to move population levels toward desired objectives. Of course, other factors such as disease, severe weather, predation, and automobile collisions influence mortality are taken into account by annual monitoring.

Delaware deer herd statistics indicate that the deer density in zone 9 was estimated in 2009 at 22.5 deer per square mile with a variability of plus or minus 20.75 percent (Rogerson 2010). This is a decrease of 58 percent from the 2005 estimated density of 39.2 deer per square mile (Rogerson 2010). The total Statewide post-hunting season deer population in 2005 was estimated at 37,563 deer, while in 2009 it was estimated at 31,071 deer, a 17.3 percent Statewide reduction. Major land use changes over the last 100 years have created a deer herd that exceeds normal deer densities of 10 to 20 deer per square mile.

High deer numbers are associated with crop damage, reduction of some forest understory species, and reduction of reforestation seedling survival, which all impact habitat that is important for a variety of wildlife. White-tailed deer hunting is the single most important public use on the refuge that would impact mammals, including deer, and other forest-dependent wildlife. It serves both as a wildlife-dependent recreational use and a method to reduce and stabilize deer densities. This benefits other mammals, including the endangered Delmarva fox squirrel.

Based on a nationwide survey of all states (Krausman 1992), deer populations are effectively controlled with hunting and habitat manipulation in many areas where they were overpopulated. In a 10-year study in northwestern Pennsylvania examining the impacts of varying densities of deer on deer health and habitat, starvation mortality resulted when densities reached higher than 25 deer per square kilometer (247 acres). Also, no prevention or control of epizootic hemorrhagic disease exists to date except by keeping populations below the carrying capacity of their habitats. Such breakouts have occurred on the refuge in the past. Based on these considerations, it is anticipated that hunting would have short-term and long-term minor-to-moderate beneficial impacts on deer health and quality and habitat condition.

Hunting resident game species on the refuge, such as deer, will result in negligible impacts on their populations because of their restricted home ranges. The refuge contributes negligibly to the State's total harvest for resident game species (figure 1.1 and tables 1.8 and 1.9). For example, since 1999, deer harvest at the refuge has ranged from 0.8 percent to 1.5 percent of Delaware's total deer harvest each year. The current harvest level of deer on the refuge (107) has a negligible impact on the Statewide deer population of 31,071 deer (Table 1.9). Given the low numbers of animals harvested from the refuge in respect to the total Statewide harvest and deer population, no cumulative impacts to local, regional, or Statewide populations of white-tailed deer are anticipated from allowing hunting of the species on the refuge. Additional information on the status of the Delaware deer herd and the Delaware hunting program can also be found in the refuge Hunt Plan (appendix C).

Figure 1.1. Delaware annual deer harvest, 1954 – 2008/09 seasons. (Source: Rogerson (2010))

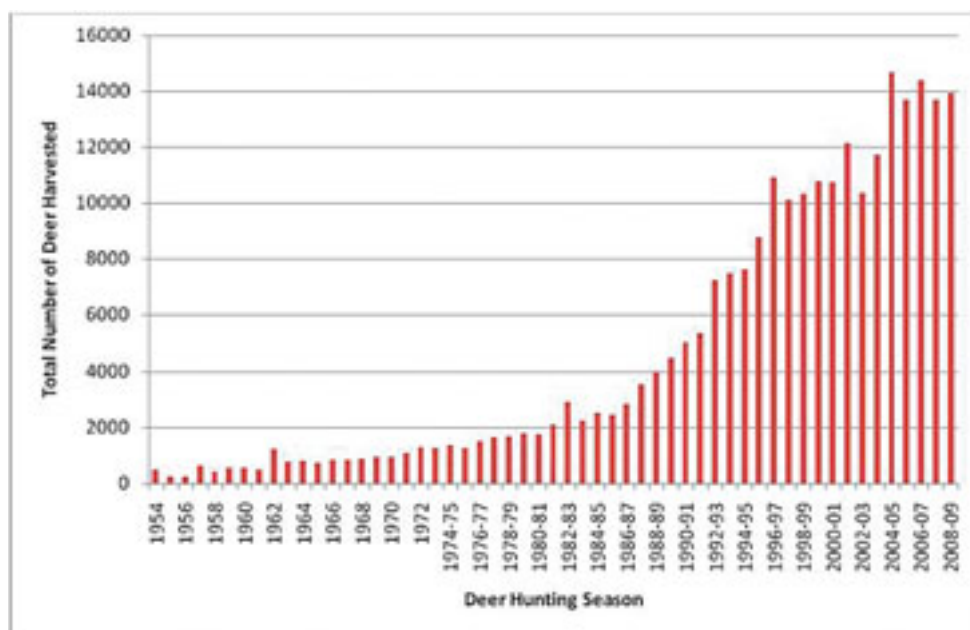


Table 1.8. Number of deer harvested and hunter visits on Prime Hook NWR compared to statewide harvest (Source: Refuge harvest data; <http://www.dnrec.state.de.us/fw/deer.pdf>; <http://www.fw.delaware.gov/Hunting/Documents/2007-08%20Historical%20Delaware%20White-tailed%20Deer%20Summary.pdf>)

Year	Statewide Deer Harvest	Refuge Deer Harvest	Refuge Hunter Visits
1988	3,998	141	1,289
1989	4,504	155	1,131
1990	5,066	178	1,689
1991	5,336	163	1,703
1992	7,245	257	1,608
1993	7,465	219	1,616
1994	7,615	169	1,568
1995	8,781	217	1,184
1996	10,915	221	1,326
1997	10,091	187	1,510
1998	10,312	138	1,335
1999	10,756	114	870
2000	10,741	125	941
2001	12,133	188	1,003
2002	10,357	160	913
2003	11,712	175	891
2004	14,669	143	841

2005	13,670	133	884
2006	14,401	120	825
2007	13,369	108	790
2008	13,926	106	670
2009	12,400*	107	552

*Data from DNREC (2010b).

Table 1.9. Cumulative impacts of existing deer hunting on Prime Hook NWR/State Deer Management Zone 9 (2009-2010 data) compared to Statewide Harvest.

Hunt Location & Type	Harvest
Prime Hook NWR	107
State Deer Management Zone 9	767
Statewide Harvest (all 17 Deer Management Zones)	12,400

Delaware permits hunting for red fox, which assists State management efforts in reducing the incidence of mange outbreaks to maintain a healthy population and reducing the predatory impact of this species on migrating and breeding birds, particularly State and federally endangered or threatened species. Hunting would be opportunistic in most cases. In other states, the incidental harvest of fox occurs during other open seasons such as deer season and the pelts are often retained for personal use. Though no county-specific data are available, healthy populations of fox exist in the State and anticipated harvest rates would result in negligible impacts to local or State populations (Reynolds, personal communication 2010).

Impacts to Amphibians and Reptiles

The direct, indirect, and cumulative effects of hunting to amphibians and reptiles such as snakes, skinks, turtles, lizards, salamanders, frogs, and toads are expected to be negligible. Hibernation or torpor by cold-blooded reptiles and amphibians limits their activity during the hunting seasons for deer, waterfowl, and upland game when temperatures are low and hunters would rarely encounter them during most of the hunting season. Turkey season occurs during the warmer months of April and May; however, the impact of turkey hunters is expected to be negligible because hunter numbers are limited to less than five and are scattered over a large area.

Impacts to Invertebrates

Impacts to invertebrates such as butterflies, moths, other insects, and spiders are expected to be negligible. Invertebrates are not active during the majority of the hunting seasons and would have few interactions with hunters during the hunting season.

Impacts on Public Use and Access

Public opportunities to hunt on the Delmarva Peninsula are decreasing with increasing private land development. Refuge lands have become increasingly important in the region as a place to engage in this activity. A recent study found that 78% of hunters in Delaware hunt on private land (U.S. Department of the Interior 2006). When asked the importance of hunting activities in the USGS Visitor and Community Survey (Sexton et. al 2007), a little over half of responses were rated as moderately to very important. Both consumptive and nonconsumptive use visitors reported that being in a natural, undeveloped area and experiencing a serene environment are equally important to their refuge experience as well as the trails that afford this opportunity (Sexton et. al 2007).

Hunters have the opportunity to harvest a renewable resource in a traditional manner, which is culturally important to the local community. Refuge lands allow the public to enjoy hunting at no or little cost in a region where private land is leased for hunting, often costing a person several hundred to several thousand dollars per year for membership. Refuge hunting programs also make special accommodations for mobility-impaired hunters and youth hunters, which provide opportunities to experience a wildlife-dependent recreational activity, instill an appreciation for and understanding of wildlife, the natural world and the environment and promote a land ethic and environmental awareness.

The moderate beneficial impacts of providing the existing level of wildlife-dependent activities, with some modest increases, include helping meet existing and future demands for outdoor recreation and education, as documented in the State Comprehensive Outdoor Recreation Plan (DNREC 2003) and in the Visitor and Community Survey (Sexton et. al 2007). Visitors interested in hunting would find high quality opportunities to engage in their favored pastime. Visitor use is increasing over time as local residents and visitors become increasingly aware of Refuge opportunities, and as we progress in creating new facilities and programs. The economic benefits of increased tourism likely would also benefit local communities. There are also hunting opportunities for individuals with disabilities.

The refuge would also be promoting a wildlife-oriented recreational opportunity that is compatible with the purpose for which the refuge was established. The public would have an increased awareness of the refuge and the National Wildlife Refuge System and public demand for more areas to hunt and learn about wildlife would be met. Over time, it is reasonable to believe that public awareness of the refuge would increase, and, in turn, visitation would increase on the areas open to hunting. The refuge may or may not be capable of meeting the demand as it increases and would depend on staffing levels and the availability of partners and volunteers to assist.

Eventually, the level and means of use resulting from this increase in visitation could change the nature of the experience for many visitors. Some may choose either to forgo hunting due to issues of crowding or behavior, or to go elsewhere. Because the refuge provides opportunities now for only a small portion of the area's hunters, if that shift occurs, it is not imminent and would likely occur outside the 15 year life of the Comprehensive Conservation Plan. If it does occur, it could put additional strains on other public lands, or diminish the refuge contribution to the mission of the Refuge System. We would work to avoid that by continuing to distribute our programs and facilities to minimize conflicts among users.

The hunting program for deer, waterfowl, upland game and webless migratory birds (dove), and turkey provides an administratively simple program that balances other public use activities, supports Presidential Executive Order: Facilitation of Hunting Heritage and Wildlife Conservation and regional directives, parallels State hunting regulations, provides seasonal closures to minimize wildlife disturbance and/or avoid conflicts with other uses, eliminates hunting fees except for lottery hunts, enhances disabled hunting opportunities, and further develops an appreciation for fish and wildlife. The number of hunters that will participate in refuge hunting opportunities varies annually; however, it is anticipated that a slight increase from current levels will occur.

Preseason lottery drawings at the refuge provide hunting opportunities for local, in-State, and out-of-State hunters. Knowing in advance of a hunting opportunity allows hunters to prepare, plan, and scout, which ultimately helps to provide a quality hunting experience.

Hunting areas will be closed to other public uses, unless the other public uses can be safely sequestered to other locations separate from the locations of hunting activity. Experience has proven that time and space zoning (e.g., establishment of separate use area, use periods, and restriction on the number of users) is an effective tool in eliminating conflicts between user groups. Seasonal closures apply to non-consumptive users during the hunting season, which is typically a slower period of use due to weather conditions. Short-term, moderate adverse impacts are expected for non-consumptive users due to the seasonal closures that are highlighted below:

- 1) Western Prime Hook Creek (from old shop ramp to Waples Pond) (Unit III): Closed every day during the deer and waterfowl hunting seasons, which typically starts on September 1 and ends in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
- 2) Deep Branch Road Trail (includes Goose & Flaxhole Ponds) and Eastern Prime Hook Creek (from old shop ramp to HQ ramp) (Unit III): Closed every day from September 1 through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
- 3) Headquarters Area (includes Turkle & Fleetwood Ponds) (Unit III): Closed only for a maximum of two days for deer hunts.

- 4) The northern portion of Unit IV (includes trail overlooking Vergie's Pond): Closed from the Monday before Thanksgiving through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
- 5) Hiking Trails on Fowler Beach Road (Unit I), Prime Hook Road (Unit III), and Slaughter Beach Road and Slaughter Canal (Unit I): Closed on Sundays from September 1 through the deer and waterfowl hunting seasons, which typically end in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.

According to the USGS Visitor and Community Survey (Sexton et. al 2007), the overall mean desirability of additional hunting opportunities was not as high as that of other public use activities. However, upon further breakdown between hunters and non-hunters, the additional hunting opportunities listed were very desirable by the hunting community.

The improvement of habitat quality from ongoing habitat management projects would likely result in an increase in some game populations and positively affect the hunting experience for many. Considerable change in the regulations and methods and practices of hunting, hunters will encounter some disruption of their expectations and routines.

White-tailed deer hunting: A total of 5,389 acres is open for deer hunting, which includes archery (to include the use of crossbows), muzzleloader, handgun, and shotgun hunting. Seasonal closures would occur to not only protect wildlife, but also to minimize conflicts between different hunting activities and/or other non-consumptive recreational uses (e.g., minimize conflict with anglers on Prime Hook Creek, offset hunting days for deer and waterfowl hunting on Prime Hook Creek and for disabled hunters in the disabled hunt area; close hunting in late November in designated areas to minimize bald eagle and waterfowl disturbance). Disabled hunting areas in Unit III and IV would limit access to individuals who are permanently confined to a wheelchair, which ensures quality opportunities for hunters with limited mobility.

The refuge proposes to open 1,513 additional acres for deer hunting which includes an area located north of Prime Hook Road commonly referred to as Oak Island, an area of red maple swamp along Prime Hook Creek and west of the existing Headquarters Area, an area north of Route 16 referred to as the Millman Tract, and an expansion of the Headquarters Area. Of these "new areas," Oak Island was previously hunted up until 1995 and the Millman Tract was hunted under private ownership up until the Service purchased it in 2001. Prime Hook Creek and its associated red maple swamp will provide additional opportunities and will be limited by access. Hunter numbers are expected to initially increase based on the opening of these areas and the opportunity for hunters to free-roam; however, cumulative impacts are expected to be negligible.

Permanent deer hunting stands will be phased out over a five-year period in all areas except the disabled hunting area. We will limit the number of permits to approximately 30 in the lottery hunt area to minimize hunter conflict in an area historically known to attract large hunter numbers. In the regular hunt area, hunting will be open every day during designated seasons (except the October antlerless and handgun seasons).

The phasing out of all permanent deer hunting stands (except non-ambulatory hunt blinds) will require hunters to find a suitable hunting location within designated hunting areas through effective scouting. Use of portable deer climbing stands is recommended but not required. Hunters have expressed an interest in scouting and choosing their hunting locations to enhance the quality of their hunt. Maintenance mowing will no longer occur to provide trails to facilitate hunting. Minor to moderate short-term adverse impacts are expected among hunters over desired hunting locations and we will continue to encourage proper hunting ethics.

Waterfowl hunting: A total of 3,455 acres is open to migratory bird hunting, which is 40% of the refuge (includes lands purchased with Land and Water Conservation Funds which are excluded from the 40% rule). Seasonal closures would occur to not only protect wildlife, but also to minimize conflicts between different hunting activities and/or other non-consumptive recreational uses (e.g., offset hunting days for deer and waterfowl hunting on Prime Hook Creek and for disabled hunters in the disabled hunt area; close hunting in late November in designated areas to minimize bald eagle and waterfowl disturbance, provide access for non-consumptive users on Sundays during the hunting season). In the lottery hunt area, hunting will occur three days per week and cease at noon. In the regular hunt area, hunting will be open every day during all waterfowl hunting seasons. Although the loss of one hunting day per week and an earlier closure at noon rather than the current 3:00pm will not be

well received by the hunting public; this perceived decrease in hunting is offset by the additional 1,732 acres being proposed to open under this alternative for waterfowl hunting.

This additional hunting acreage includes: an area between Slaughter Beach Road and Fowler Beach Road referred to as Unit I, an area located south of Prime Hook Road, Prime Hook Creek, an area along the Broadkill River in Unit IV, and a reconfiguration of the existing waterfowl hunt area in Unit III. Of these “new areas,” Unit I was already open to dove hunting and Prime Hook Creek was hunted up until 1991. Hunter numbers are expected to initially increase based on the opening of these areas and the opportunity for hunters to free-roam in the regular waterfowl areas; however, cumulative impacts are expected to be negligible.

Although the permanent waterfowl blinds on the refuge will be phased out over a five-year period, we still require hunters in the lottery hunt area to hunt within a defined area around a designated blind site (marker). This will minimize hunter conflict in an area historically known to attract large hunter numbers. In past years for daily drawings on opening days, it was common to see over 60 to 80 duck hunting parties compete for 27 available hunting opportunities.

The phasing out of all permanent waterfowl hunting blinds (except non-ambulatory blinds) in lieu of blind sites in the lottery hunt area will now require hunters to provide their own means to camouflage themselves (e.g., boat blind, pop up blind, etc.). Hunters would be required to find a suitable hunting location within a specified area around the blind site marker. Hunters have expressed an interest in scouting and having the flexibility to adjust their hunting locations for weather conditions to enhance the quality of their hunt. In free roam areas, hunters may hunt anywhere in the designated area. Minor to moderate short-term adverse impacts are expected among hunters over desired hunting locations and proper hunting ethics will be encouraged.

The creation of sanctuaries in Unit III will result in the elimination of 6 hunting blinds from the 19 available federal blinds; however 9 new blinds sites will be added. These 9 new blinds sites, which include a wheelchair accessible blind, brings the total number of federal blind sites to 22 and does not include the 8 blinds on the state owned Prime Hook Wildlife Area. The addition of new free-roam waterfowl hunting areas in salt marsh habitats in Unit I and IV will also provide quality opportunities.

Upland game and webless migratory bird hunting: A total of 1,957 acres are available for hunting of upland game and webless migratory birds. Dove hunting will not be open on 105 of these acres, which should affect few hunters.

Wild turkey hunting: A total of 3,472 acres are open for hunting wild turkey until noon on selected hunt days. In recent years, hunter and staff observations indicate that a huntable population of turkeys may exist on the refuge. Limited opportunities exist on public lands to hunt turkey and the refuge may contribute to providing additional quality opportunities for hunters.

The refuge would collaborate with the Delaware Division of Fish & Wildlife to evaluate the status of the wild turkey population on the refuge. Hunting will be permitted if State and refuge personnel determine that the turkey population in the area is sufficient to support hunting on the refuge. It is anticipated that a limited number of hunters (less than five per year). Permits would be issued through preseason lottery drawing. The elimination of nearly all hunting permit fees (except for lottery hunts) should be well received by hunters. An administratively simplified hunting program minimizes the amount of staffing resources needed to conduct the hunt by as much as 54 staff days and by \$17,890 from the previous program and thereby reduces the administrative burden and minimizes the amount of staffing resources needed to conduct the hunt. The minor beneficial impact to the hunter is a reduction in the cost to hunt.

Fees are required to manage the lottery hunts for deer, waterfowl, and turkey. The refuge Recreation Act requires that funds are available for the development, operation, and maintenance of the permitted forms of recreation. The permit fee (\$10 for deer and turkey; \$15 for waterfowl), preseason application fee (\$5/hunter), and processing fee for permits acquired after the preseason drawing (\$2-3 per hunt) are the minimal amounts needed to offset the cost of facilitating the preseason drawings and manage the lottery hunts. Due to the uncertainty in the level of hunter participation in future years, permit fees may need to be adjusted (increased

or decreased) and therefore will be evaluated. Preseason lottery drawings will be administered by a contracted company which will collect information and required fees, conduct the drawing, and issue the permits. This may reduce our costs by over \$3,000 and application and processing fees will be paid to the contractors for administering this permitting process. Refuge staff will work with the contractor to provide the highest level of customer support to refuge users. New fees for preseason application for waterfowl and turkey hunting, new processing fees for standby permits, and charging a flat blind fee for waterfowl rather than an individual fee are anticipated to be unpopular with the hunting public.

Expanding hunting opportunities is expected to have moderate adverse impacts on a certain segment of the public that does not desire any change in public use programs and regulations, or that may hold differing views on the course of action. In addition, while new visitors become familiar with those changes, violations could increase. Some conflict between wildlife observers, photographers, students, and other refuge users is expected to result in short-term, moderate adverse impacts, which will be managed through seasonal closures. Negative reactions by some visitors may be caused by the closure of the western end of Prime Hook Creek to all uses (mainly fishing, canoeing, and kayaking) other than hunters from September 1 through the end of the deer and waterfowl hunting seasons; the closure of the eastern end of Prime Hook Creek from September 1 through March 15; and the temporary closure of the general public use area near the Refuge Headquarters to conduct deer hunts. Seasonal closures for hunting occur during the fall and winter months, which is typically a slower period of use due to weather conditions. Refuge officers would enforce these and other current refuge regulations, where appropriate, and would seek the assistance and cooperation of Delaware Division of Fish & Wildlife in enforcing common regulations, to provide a safe environment for refuge visitors and promote activities that are compatible with protecting the resources.

Dome conflict between concurrent hunting programs is anticipated (e.g., waterfowl, deer, and upland game hunting seasons overlapping). For the majority of the hunting seasons, the Delaware Division of Fish & Wildlife has made efforts to avoid these overlaps in the various hunting programs. As public use levels expand across time, unanticipated conflicts between user groups may occur. The refuge's visitor use programs would be adjusted as needed to eliminate or minimize each conflict and provide quality wildlife-dependent recreational opportunities. The Service's law enforcement efforts will be increased.

The refuge would work closely with State, Federal, and private partners to minimize impacts to adjacent lands and its associated natural resources. Due to an increase in new hunting areas and by allowing hunters to free roam, an increase in violations may occur until hunters become familiar with the refuge boundaries and regulations. As a result some landowner conflicts may erupt due to hunter trespassing. These minor short-term adverse impacts will be minimized through enhanced law enforcement efforts. For example, waterfowl hunting zones in Unit IV along the Broadkill River have the potential to conflict with nearby existing blinds on private lands. This activity will be evaluated and zones adjusted accordingly. Hunters will most likely opt to hunt within the marsh areas of these zones and not along the Broadkill River, which would lessen any direct conflicts with hunters on these nearby private lands.

Refuge Facilities: Minimal infrastructure, which includes the addition of two to three parking areas, enhancement of existing boat ramps, and placement of informational signs, is anticipated in support of this priority public use. There would be some costs associated with these programs in the form of road maintenance, law enforcement, and boat ramp maintenance. These costs should be minimal relative to total refuge operations and maintenance costs and would not diminish resources dedicated to other refuge management programs. Impacts to refuge resources are expected to be negligible.

Other Past, Present, Proposed, and Reasonably Foreseeable Actions and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The proposed hunt plan has been designed to be sustainable through time given relatively stable conditions.

Due to hunting history of low hunter use and harvest for resident geese and late season snow geese, the refuge has been closed during these seasons but will consider reopening if demand and opportunity exist and conflicts are minimized.

Greater snow geese have undergone a dramatic increase in recent decades, to current population estimates of over 1 million birds. Natural marsh habitats on some migration and wintering areas have been impacted by the destructive feeding strategies of overabundant light geese (Giroux and Bedard 1987, Giroux et al. 1998, Widjeskog 1977, Smith and Odum 1981, Young 1985). In addition, goose damage to agricultural crops has become a problem (Bedard and Lapointe 1991, Filion et al. 1998, Giroux et al. 1998, Delaware Div. of Fish and Wildlife 2000). Snow geese use the refuge wetland habitats extensively, and are not subjected to any hunting disturbance or mortality on the refuge. Impacts to refuge wetlands and impacts to wetland-dependent wildlife increase over time if the population is not adequately controlled at the flyway level, through the coordinated efforts of individual agencies.

Similarly, resident Canada geese have been shown to cause changes in wetland community structure (Laskowski et al. 2002). Resident geese can reduce the amount of plant biomass that would be available to migrant birds at the end of the growing season. Direct damage to agricultural resources by resident geese includes grain crops, trampling and spring seedlings. Heavy grazing by geese can result in reduced yields and in some instances a total loss of the grain crop (Allen et al. 1985, Flegler et al. 1987). Thus, uncontrolled Canada goose populations on the refuge can affect migratory bird populations utilizing the refuge as well as contribute to agricultural losses on lands surrounding the refuge.

The refuge will consider participating in additional deer hunting seasons if an overabundance of deer arises, as determined the Delaware Division of Fish & Wildlife (DFW) and concurrence by the refuge (Refer to Resident Wildlife Section for impacts of deer overabundance).

If visitation levels expand in the unforeseen future, unanticipated conflicts between user groups may occur. Service experience has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) and limiting visitations are effective tools in eliminating conflicts between user groups.

Anticipate Impacts if Individual Actions are Allowed to Accumulate

National Wildlife Refuges, including Prime Hook NWR, conduct hunting programs within the framework of State and Federal regulations. Hunting at the refuge is at least as restrictive as the State of Delaware and in some cases more restrictive. By maintaining hunting regulations that are as, or more, restrictive than the State, individual refuges ensure that they are maintaining seasons which are supportive of management on a more regional basis. Additionally, the refuge coordinates with the DFW annually to maintain regulations and programs that are consistent with the states' management programs.

The cumulative impact of hunting on migratory and resident wildlife populations at Prime Hook NWR is negligible. As described in the previous sections, the proportion of the refuge's harvest of waterfowl, deer, and small game is negligible when compared to local, regional, and flyway populations and harvest.

Because of the regulatory process for harvest management of migratory birds in place within the Service, the setting of hunting seasons largely outside the breeding seasons of resident and migratory wildlife, the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, and the wide geographic separation of individual refuges, we anticipate no direct or indirect cumulative effects on resident wildlife, migratory birds, and non-hunted wildlife of hunting on Prime Hook NWR.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the refuge's Comprehensive Conservation Plan and Environmental Impact Statement. Public notification and review include a notice of availability published in the *Federal Register*, a 60-day comment period, and local media announcements.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible
- ☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will manage the hunt program in accordance with Federal and State regulations and review it annually to ensure wildlife and habitat goals are achieved and that the program is providing a safe, high quality hunting experience for participants. The refuge based these stipulations on our draft CCP and Environmental Impact Statement on Hunting, Hunting Management Plan, and refuge-specific regulations (See Description of Use section).

To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, hunting can occur on the refuge if the refuge-specific regulations highlighted in this document and following stipulations are met:

- This use must be conducted in accordance with State and federal regulations, and special refuge regulations published in the refuge Hunting Regulations and Public Use Regulations brochures.
- A network of waterfowl sanctuaries will be maintained to ensure that migratory birds have adequate resting and feeding areas while hunting seasons are occurring.
- This use is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats.
- Law Enforcement Officer(s) will promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Law Enforcement personnel will monitor all areas and enforce all applicable State and Federal Regulations.
- The refuge manager may, upon annual review of the hunting program and in coordination with the Delaware Division of Fish and Wildlife, impose further restrictions on hunting, recommend that the refuge be closed to hunting, or further liberalize hunting regulations within the limits of state seasons and regulations. Hunting restriction may be implemented if it conflicts with other, higher priority refuge programs or endangers refuge resources or public safety.

JUSTIFICATION:

Hunting is a priority wildlife-dependent use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

Hunting seasons and bag limits are established by the State of Delaware and generally adopted by the refuge. These restrictions ensure the continued well-being of overall populations of game animals. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. Specific refuge regulations address equity and quality of opportunity for hunters, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. Loss of plants from boat or foot traffic is minor, or temporary, since hunting occurs mainly after the growing season.

Conflicts between hunters are localized and are addressed through law enforcement, public education, and continuous review and updating to State and refuge hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, the location of most hunting away from public use facilities, and seasonal area closures.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

This activity will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose for which the Refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE:

LITERATURE CITED:

See CCP Bibliography.

COMPATIBILITY DETERMINATION

USE:

Wildlife Observation, Wildlife Photography, Environmental Education, and Interpretation

REFUGE NAME:

Prime Hook National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

1. Migratory Bird Conservation Act {16 U.S.C. 715d}
2. Refuge Recreation Act {16 U.S.C. 460 K-1}

REFUGE PURPOSE(S):

1. "...for use as an inviolate sanctuary, or for any other management purposes, for migratory birds..." {16 U.S.C. 715d; Migratory Bird Conservation Act}
2. "...incidental fish and wildlife-oriented recreational development" {16 U.S.C. 460k-1; Refuge Recreation Act}
3. "the protection of natural resources" {16 U.S.C. 460k-1; Refuge Recreation Act}
4. "the conservation of endangered or threatened species..." {16 U.S.C. 460k-1; Refuge Recreation Act}

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

The use is wildlife observation, wildlife photography, environmental education, and interpretation. These are priority public uses identified by Executive Order 12996 (March 25, 1996) and by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?

The use would be conducted within the refuge's 10,132 acres, which lie between Slaughter Beach and the Broadkill River along the southeastern coastline of Delaware. In all four units, we plan to highlight viewing areas along the State roads (Slaughter Beach Road, Fowler Beach Road, Prime Hook Road, and Broadkill Road) in an interpretive auto tour route, where a visitor can access information about the refuge using advanced technology (radio, compact disc, cell phone, downloadable programming, etc.). Designated areas open to visitors for wildlife observation, photography, environmental education, and interpretation are as follows (see Map 4-15 for an illustration of where these uses would be conducted on the refuge):

Unit I (Slaughter Beach Road to Fowler Beach Road): Wildlife observation and photography are the primary uses at designated areas at Fowler Beach, Slaughter Canal, and along the roadsides of Slaughter Beach Road and Fowler Beach Road. This area includes interpretive signs at Fowler Beach, information kiosks (one at Slaughter Beach and two on Fowler Beach Road), parking areas, and an unimproved boat ramp on Fowler Beach Road. Access to the Slaughter Canal is by boat only. We plan to provide access to existing interior roads and trails on the north side of Fowler Beach Road and south side of Slaughter Beach Road for wildlife observation and photography opportunities. A new parking area will be established on the north side of Fowler Beach Road.

Unit II (Fowler Beach Road to Prime Hook Road): Wildlife observation and photography are the primary uses at Slaughter Creek on Cods Road and roadside pull-offs along Prime Hook Road. The area includes two information kiosks on Prime Hook Road and parking areas. We plan to provide access to an existing interior road on the south side of Fowler Beach for wildlife observation and photography opportunities by adding a wheelchair accessible photography blind near a restored wetland area. Visitors can use the new parking area mentioned in the Unit I description. Access to the north side of Fowler Beach Road will be from the existing interior road and trail network.

Unit III (Prime Hook Road to Broadkill Beach Road): Wildlife observation, photography, environmental education, and interpretation are important uses in this area of the refuge. The majority of the public use infrastructure is located near the refuge headquarters. This area includes 5.1 miles of hiking trails (Blue Goose Trail, Photography Blind Trail, Dike Trail-wheelchair accessible, Black Farm Trail, Pine Grove Trail, and Boardwalk Trail-wheelchair accessible); canoe trail on Prime Hook Creek and the Headquarters Canal Ditch; Turtle and Fleetwood Ponds; Goose & Flaxhole Ponds; Petersfield Ditch; trailhead kiosks; informational kiosks (one in partnership with Delaware Division of Fish and Wildlife on Little Neck Road); highway direction signage; parking areas; restrooms; a photography blind; wheelchair accessible observation platform (Dike Trail); wheelchair accessible fishing pier (Fleetwood Pond); numerous interpretive signs and kiosk maps; Visitor Contact Station containing interpretive displays and various mounted animal species; four refuge boat ramps; roadside pull-offs along Broadkill Beach Road; refuge auditorium; an environmental education pavilion; wildlife observation and photography opportunities through special events, programs, and benches along hiking trails. The areas immediately surrounding the refuge office and associated trails provide opportunities for environmental education. We also participate in off-refuge events in Milton, such as the Horseshoe Crab-Shorebird Festival and the Youth Fishing Event.

We plan to enhance opportunities in this area by extending the trail network near the deer check station to provide additional parking and hiking opportunities; developing new facilities for environmental education and visitor services programs; and providing access to existing interior roads and trails on the south side of Prime Hook Road and near Goose Pond (off Deep Branch Road) for wildlife observation and photography opportunities.

Unit IV (Broadkill Beach Road to Broadkill River): Wildlife observation and photography are the primary uses in this area. This area includes roadside pull-offs along Broadkill Beach Road. We plan to reevaluate the trail and observation platform overlooking Vergie's Pond.

(c) When would the use be conducted?

Except as noted below, the refuge is open for wildlife observation, wildlife photography, environmental education, and environmental interpretation in the following areas everyday from open one-half hour before sunrise to one-half hour after sunset. Some areas are seasonally restricted to minimize conflict among user groups and to minimize wildlife disturbance.

- 1) Designated beach dunes and overwash areas (Units I & II): Closed from March 1 through September 1 due to nesting State endangered least terns and American oystercatchers, and the potential for use by federally endangered piping plovers. Areas may be reopened if no nesting activity occurs or when nesting ends for the season.
- 2) Western Prime Hook Creek (from old shop ramp to Waples Pond) (Unit III): Closed every day during the deer and waterfowl hunting seasons, which typically starts on September 1 and ends in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.

- 3) Deep Branch Road Trail (includes Goose & Flaxhole Ponds) and Eastern Prime Hook Creek (from old shop ramp to HQ ramp) (Unit III): Closed every day from September 1 through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
- 4) Headquarters Area (includes Turkle & Fleetwood Ponds) (Unit III): Closed only for a maximum of two days for deer hunts.
- 5) The northern portion of Unit IV (includes trail overlooking Vergie's Pond): Closed from the Monday before Thanksgiving through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
- 6) Hiking Trails on Fowler Beach Road (Unit I), Prime Hook Road (Unit III), and Slaughter Beach Road and Slaughter Canal (Unit I): Closed except for Sundays from September 1 through the deer and waterfowl hunting seasons, which typically end in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
- 7) Roadside pull offs and water control structures/fishing areas at Petersfield Ditch (Unit III), Slaughter Canal (Unit I) & Cods Road (Unit II): Open year round.

(d) How would the use be conducted?

These four priority public uses would be allowed on established roads, trails, parking areas, and in buildings that have been designed to accommodate such uses and in areas that are least sensitive to human intrusion. Uses would be conducted for the general public, as well as for organized groups, including schools and scout groups. Brochures and maps depicting the roads and trails open for these uses are available at the Visitor Contact Station and on the refuge's website.

Environmental education and interpretation will be conducted by way of personal presentations by staff and volunteers, teachers and other youth leaders, and at special events and displays both on and off the refuge. Educational and interpretive information will also be provided via signage, kiosks, printed information, exhibits, audiovisual presentations, and lecture programs. Wildlife observation and photography are self-conducted and are facilitated through the availability of trails, viewing areas, tours, and informational materials. Wildlife observation programs such as birding field trips, canoe trips, and other nature walks are frequently given. Viewing scopes are provided in designated areas. The refuge also promotes wildlife photography with the Friends of Prime Hook NWR through the annual nature photography contest and exhibition.

Refuge staff are responsible for on-site evaluations to resolve public use issues; monitor and evaluate impacts; maintain boundaries and signs; meet with interested public; recruit volunteers; prepare and present interpretive and educational programs; maintain existing trails and viewing areas; revise leaflets and develop new information materials, install and/or update kiosks; develop needed signage; organize and conduct refuge events; conduct regularly scheduled programs for the public; display off-site exhibits at local events; develop relationships with media; provide law enforcement and security; and respond to public inquiries.

Boats enter refuge waters from access points on Slaughter Canal at Fowler Beach Road, at Waples Mill Pond on the Brumbley Family Campground, at the office boat ramp, at the ramp at the old maintenance facility, at suitable sites on Goose and Flaxhole Ponds, and at boat ramps at Turkle and Fleetwood Ponds.

At Fowler Beach, access for these activities will occur only on refuge owned lands on the sandy part of the beach from the toe of the dunes to the Delaware Bay (mean high water demarcation to mean low water demarcation). One parking lot with a dune crossover provides access to the beach. Access on the dune and adjacent marshes is prohibited.

In addition to published 50CFR regulations and State regulations, refuge-specific regulations also apply for Wildlife Observation & Photography, Environmental Education & Interpretation and are as follows:

- 1) No refuge-specific permits are required.
- 2) All boats must be off the water at sunset.

- 3) Boat motor restrictions
 - a) 30 horsepower motor restriction on Prime Hook Creek and Slaughter Canal
 - b) Electric motors or manual propulsion only on Turkle & Fleetwood Ponds
 - c) Manual propulsion only on Goose & Flaxhole Ponds
 - d) Air thrust boats and jet skis are not permitted
 - e) A “Slow No Wake” zone of one-half mile has been established on the Headquarters Ditch.
- 4) Areas may be closed on the refuge without prior warning.
- 5) Visitors must stay on the designated trail routes and areas.
- 6) Except as noted below, the refuge is open for wildlife observation, wildlife photography, environmental education, and environmental interpretation in the following areas everyday from open one-half hour before sunrise to one-half hour after sunset. Some areas are seasonally restricted to minimize conflict among user groups and to minimize wildlife disturbance.
 - a) Designated beach dunes and overwash areas: Closed from March 1 through September 1 due to nesting State endangered least terns and American oystercatchers, and the potential for use by federally endangered piping plovers. Areas may be reopened if no nesting activity occurs or when nesting ends for the season.
 - b) Western Prime Hook Creek (from old shop ramp to Waples Pond): Closed every day during the deer and waterfowl hunting seasons, which typically starts on September 1 and ends in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - c) Deep Branch Road Trail (includes Goose & Flaxhole Ponds) and Eastern Prime Hook Creek (from old shop ramp to HQ ramp): Closed every day from September 1 through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - d) Headquarters Area (includes Turkle & Fleetwood Ponds): Closed only for a maximum of two days for deer hunts.
 - e) The northern portion of Unit IV (includes trail overlooking Vergie’s Pond): Closed from the Monday before Thanksgiving through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - f) Hiking Trails on Fowler Beach Road, Prime Hook Road, and Slaughter Beach Road and Slaughter Canal: Closed except for Sundays from September 1 through the deer and waterfowl hunting seasons, which typically end in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - g) Roadside pulloffs and water control structures/fishing areas at Petersfield Ditch, Slaughter Canal & Cods Road: Open year round.
- 7) Dog walking is not permitted on the refuge.
- 8) Bicycling is allowed only on roads open to public vehicular traffic.
- 9) The Visitor Contact Station is open weekdays from 7:30am to 4:00pm and seasonally on weekends.
- 10) The following activities are prohibited, including, but not limited to: ice skating, camping, roller blading, horseback riding, geocaching/metal detecting, off-road and mountain biking, off-road vehicles including ATVs, picnicking, dog walking, competitions or organized group events (e.g. cross country races), non-competitive organized events (e.g., weddings), operation of model boats and airplanes, swimming and sunbathing, waterskiing, personal watercraft (PWC), air thrust boats, soliciting of funds (per 50CFR 27.97 for Private Operations and per 50CFR 27.86 for Begging), and other activities identified in 50CFR Part 27.

- 11) All boaters would be required to operate their craft and possess all safety equipment in accordance with Delaware State and U.S. Coast Guard Regulations.
- 12) Beach access will occur only on refuge owned lands on the sandy part of the beach from the toe of the dunes to the Delaware Bay (mean high water demarcation to mean low water demarcation). One parking lot with a dune crossover provides access to the beach. Access on the dune and adjacent marshes is prohibited.

(e) Why is this use being proposed?

Wildlife observation, wildlife photography, environmental education, and interpretation are Priority Public Uses as defined by The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and if compatible, are to receive enhanced consideration over other general public uses.

These uses are conducted to provide compatible educational and recreational opportunities for visitors to enjoy the resource and to gain understanding and appreciation for fish and wildlife, wild lands ecology and the relationships of plant and animal populations within the ecosystem, and wildlife management. These uses will provide opportunities for visitors to observe and learn about wildlife and wild lands at their own pace in an unstructured environment and to observe wildlife habitats firsthand. These uses will enhance the public's understanding of natural resource management programs and ecological concepts to enable the public to better understand the problems facing our wildlife/wild lands resources, to realize what effect the public has on wildlife resources, to learn about the U.S. Fish and Wildlife Service's (Service) role in conservation, to better understand the biological facts upon which Service management programs are based, and to foster an appreciation for the importance of wildlife and wild lands. It is anticipated that participation in these uses will result in a more informed public, with an enhanced stewardship ethic and enhanced support and advocacy for Service programs.

These uses will also provide wholesome, safe, outdoor recreation in a scenic setting, with the realization that those who come strictly for recreational enjoyment will be enticed to participate in the more educational facets of the public use program, and can then become informed advocates for the refuge and the Service.

AVAILABILITY OF RESOURCES:

Allowing the use of wildlife observation, photography, environmental education, and interpretation is within the resources available to administer our Visitor Services program with the current level of participation and to ensure that the use remains compatible with the refuge purposes. Additional funding for visitor services improvements can also come from challenge cost share projects, grant funds, and contributions. Compliance with refuge regulations is handled within the regular duties of the Station Law Enforcement Officer. As funding is available, the refuge will complete and maintain projects and facilities. Volunteers and partners will be utilized to help with construction and maintenance.

Facilities or materials needed to support this use include maintaining access roads, parking areas, gates, roadside pull-offs, kiosks, signs, the Visitor Contact Station, observation platforms, photography blinds, environmental education pavilion, wheelchair accessible fishing pier, boat launching areas, and hiking and canoeing trails; upgrading some of the existing boat launching areas; and providing information in refuge publications and the refuge's website.

In 2009, funds were allocated to upgrade refuge public use signage. Sufficient staff and maintenance funding within our base budget of nearly \$596,000 is available to make annual progress toward completion of all the projects described above and to maintain those already completed.

ANTICIPATED IMPACTS OF THE USE:

For a more complete analysis of the impacts of wildlife observation, photography, environmental education and interpretation, refer to chapter 5 of the CCP.

Wildlife observation and photography and environmental education and interpretation can result in positive or negative impacts to the wildlife resource. A positive effect of allowing visitor's access to the refuge will be the provision of additional wildlife-dependent recreational opportunities and a better appreciation and more complete understanding of the wildlife and habitats associated with Delmarva ecosystems.

Disturbance of refuge resources is the primary concern regarding commercially guided activities for wildlife observation. While field trip routes and observation sites are usually located in areas open to the general public, disturbance caused by large groups could be more intense because the number of people, and desire to get close to wildlife, may be greater than what normally occurs during general public activities. This disturbance will displace individual animals to adjacent areas of the refuge.

The refuge expects that wildlife observation, wildlife photography, environmental education, and environmental interpretation will have negligible short-term, long-term or cumulative impacts on the economy of the towns or county in which the refuge lies. We would not expect these activities to considerably alter the demographic of economic characteristics of the local community. No adverse impacts are foreseen to be associated with changes in the community character or demographic composition. In addition, impacts are expected to be negligible based on our observations of past visitor impacts from these uses.

Wildlife observation, wildlife photography, environmental education, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on soils, local or regional air quality, and hydrology or water quality. Environmental education activities that involve the sampling of wetlands and ponds could cause temporary, localized, minor impacts on water quality as the students disturb the bottom of the pond or walk on the marsh to gather specimens. Negative impacts to water quality can also result from human waste and litter.

Wildlife observation, wildlife photography, environmental education, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on vegetation.

Negligible disturbance to vegetation will occur during the construction of new parking areas on Fowler Beach Road and on Broadkill Beach Road to facilitate wildlife observation/photography activities because existing interior roads and access routes will be used. Additionally, shoreline and bank activities such as hiking, wildlife viewing, photography, and environmental education programs can result in trampling of vegetation.

Disturbance factors resulting from public use are always considered for all listed species. Of these, impacts on the piping plover, American oystercatcher, common tern, Forster's tern, and least tern will be minimized through the seasonal closure of designated beach dunes and overwash areas from March 1 through September 1. A Section 7 Evaluation has been conducted as part of this review and it was determined that proposed activities would not likely affect the Delmarva fox squirrel. The bald eagle, a State-endangered species occurs on the refuge and areas near active bald eagle nests will not be open at anytime for wildlife observation, photography, environmental education, and interpretation and, therefore, are not expected to have any negative impacts on bald eagles (U.S. Fish and Wildlife Service 2007).

Wildlife observation, wildlife photography, environmental education, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on waterfowl.

Providing waterfowl sanctuaries will minimize some of these impacts and allow waterfowl to have undisturbed access to these areas during biologically critical periods of the day. To minimize waterfowl disturbance from these uses, the refuge has designated approximately 3,000 acres as waterfowl sanctuaries that will be closed to hunting and other recreational use on a seasonal or annual basis.

This use is expected to have negligible adverse short-term, long-term or cumulative impacts on shorebirds and landbirds. We expect indirect impacts to landbirds to increase due to proposed expansions in public use activities including wildlife observation, wildlife photography, environmental education and interpretation. Disturbance to landbirds in proposed areas for wildlife observation, photography, and fishing is expected to be negligible since all visitors will be required to be on designated walking trails and access routes.

Wildlife observation, wildlife photography, environmental education, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on secretive marsh and waterbirds. We expect negligible impacts to secretive marsh and waterbirds due to proposed expansions in public use activities including wildlife observation, wildlife photography, and environmental education and interpretation. An increase in the number of hiking trails, particularly in or near wetland areas, has the potential to increase disturbance to secretive marsh and waterbirds.

Impacts to fisheries from visitors engaged in wildlife observation, photography, environmental education and interpretation are expected to be temporary and minor. Use of boats and canoes will cause increased suspension of bottom sediments, which should not adversely affect biological oxygen demand for fisheries resources. Boat motors may also harm submerged or emergent vegetation, which may cause a negligible negative impact to protective cover for fisheries.

Wildlife observation, wildlife photography, environmental education, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on mammals.

We also evaluated these uses for their potential to benefit or adversely affect amphibians and reptiles or their habitats used for mating, reproduction, over-wintering, and foraging. Public outreach and education efforts by the refuge that emphasize buffering of wetlands, connectivity and easy access between forest, grassland, and wetlands, protection of vernal pools, and augmentation of patch size will benefit amphibians and reptiles on an even larger scale where embraced by other landowners. Additionally, impacts to invertebrates such as butterflies, moths, other insects, and spiders are expected to be negligible.

The beneficial impacts of providing the existing level of wildlife-dependent activities, with some modest increases, include helping meet existing and future demands for outdoor recreation and education, as documented in the State Comprehensive Outdoor Recreation Plan (DNREC 2003) and in the Visitor and Community Survey (Sexton et. al 2007). Visitor use is increasing over time as local residents and visitors become increasingly aware of refuge opportunities, and as we progress in creating new facilities and programs. The economic benefits of increased tourism likely would also benefit local communities.

Expanding opportunities for these uses is expected to have adverse impacts on a certain segment of the public that does not desire any change in public use programs and regulations, or that may hold differing views on the course of action. In addition, while new visitors become familiar with those changes, violations could increase. Some conflict between wildlife observers, photographers, students, and other refuge users is expected to result in short-term moderate adverse impacts, which will be managed through seasonal closures.

Guided tour activities may also conflict with other refuge users. For example, commercial or non-commercial tours will most likely use the same areas as independent wildlife viewers, kayakers and canoeists, and hunters and anglers during open seasons. Unregulated or inadequately regulated commercial guiding operations may adversely affect the safety of other refuge users, the quality of their experience, and the equity of opportunity.

Expanded facilities for environmental education and new or expanded visitor services programs are expected to increase public awareness of, and visitation to, the refuge, and would enable staff to provide better customer service. We would expect a certain level of inconvenience during the construction of refuge facilities. The adverse effects generally are short-term, and more than offset by the long-term gains in public education and appreciation. Impacts to refuge resources are expected to be negligible.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the refuge's Comprehensive Conservation Plan and Environmental Impact Statement. Public notification and review include a notice of availability published in the *Federal Register*; a 60-day comment period, and local media announcements.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible
- ☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will manage these four priority public uses (wildlife observation, photography, environmental education, and interpretation) in accordance with Federal and State regulations and review it annually to ensure wildlife and habitat goals are achieved and that these programs are providing safe, high quality experiences for participants. The refuge based these stipulations on our 1993 Public Use Plan; draft CCP and Environmental Impact Statement, and refuge-specific regulations (See Description of Use section).

To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, wildlife observation, photography, environmental education, and interpretation can occur on the refuge if the refuge-specific regulations are followed and following stipulations are met:

- 1) This use must be conducted in accordance with state and federal regulations (50CFR), and special refuge-specific regulations published in the Public Use Regulations brochure.
- 2) The public use program will be reviewed annually to ensure that it contributes to refuge objectives in managing quality recreational opportunities and protecting habitats, and is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats. Refuge Law Enforcement Officer(s) will promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Refuge Law Enforcement personnel will monitor all areas and enforce all applicable State and Federal Regulations.
- 3) No refuge-specific permits are required.
- 4) All boats must be off the water at sunset.
- 5) Boat motor restrictions
 - a) 30 horsepower motor restriction on Prime Hook Creek and Slaughter Canal
 - b) Electric motors or manual propulsion only on Turkle & Fleetwood Ponds
 - c) Manual propulsion only on Goose & Flaxhole Ponds
 - d) Air thrust boats and jet skis are not permitted
 - e) A “Slow No Wake” zone of one-half mile has been established on the Headquarters Ditch
- 6) Areas may be closed on the refuge without prior warning.
- 7) Visitors must stay on the designated trail routes.
- 8) Except as noted below, the refuge is open for wildlife observation, wildlife photography, environmental education, and environmental interpretation in the following areas everyday from open one-half hour before sunrise to one-half hour after sunset. Some areas are seasonally restricted to minimize conflict among user groups and to minimize wildlife disturbance
 - a) Designated beach dunes and overwash areas: Closed from March 1 through September 1 due to nesting State endangered least terns and American oystercatchers, and the potential for use by federally endangered piping plovers. Areas may be reopened if no nesting activity occurs or when nesting ends for the season.

- b) Western Prime Hook Creek (from old shop ramp to Waples Pond): Closed every day during the deer and waterfowl hunting seasons, which typically starts on September 1 and ends in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - c) Deep Branch Road Trail (includes Goose & Flaxhole Ponds) and Eastern Prime Hook Creek (from old shop ramp to HQ ramp): Closed every day from September 1 through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - d) Headquarters Area (includes Turkle & Fleetwood Ponds): Closed only for a maximum of two days for deer hunts.
 - e) The northern portion of Unit IV (includes trail overlooking Vergie's Pond): Closed from the Monday before Thanksgiving through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - f) Hiking Trails on Fowler Beach Road, Prime Hook Road, and Slaughter Beach Road and Slaughter Canal: Closed except for Sundays from September 1 through the deer and waterfowl hunting seasons, which typically end in early February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order and/or turkey hunting.
 - g) Roadside pulloffs and water control structures/fishing areas at Petersfield Ditch, Slaughter Canal & Cods Road: Open year round.
- 9) Dog walking is not permitted on the refuge.
 - 10) Bicycling is allowed only on roads open to public vehicular traffic.
 - 11) The Visitor Contact Station is open weekdays from 7:30am to 4:00pm and seasonally on weekends.
 - 12) Groups of 15 or more pedestrian travelers and groups of six or more cyclists will require a Special Use Permit.
 - 13) The following activities are prohibited, including, but not limited to: ice skating, camping, roller blading, horseback riding, geocaching/metal detecting, off-road and mountain biking, off-road vehicles including ATVs, picnicking, dog walking, competitions or organized group events (e.g. cross country races), non-competitive organized events (e.g., weddings), operation of model boats and airplanes, swimming and sunbathing, waterskiing, personal watercraft (PWC), air thrust boats, soliciting of funds (per 50CFR 27.97 for Private Operations and per 50CFR 27.86 for Begging), and other activities identified in 50CFR Part 27.
 - 14) Beach access will occur only on refuge owned lands on the sandy part of the beach from the toe of the dunes to the Delaware Bay (mean high water demarcation to mean low water demarcation). One parking lot with a dune crossover provides access to the beach. Access on the dune and adjacent marshes is prohibited.
 - 15) Access to closed areas or use during the refuge's closed hours requires a special use permit, which is subject to the refuge manager's approval, unless the activity is in conjunction with a refuge staff- or volunteer-led program
 - 16) Changes outlined in the CCP dealing with closed and seasonally closed areas and public use regulations, when approved, will be incorporated into their respective public use program.

JUSTIFICATION:

Wildlife observation, photography, environmental education, and interpretation are priority wildlife-dependent uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

Specific refuge regulations address equity and quality of opportunities for visitors and help safeguard refuge habitats. Impacts from this proposal, short-term and long-term, direct, indirect, and cumulative, are expected to be minor and are not expected to diminish the value of the refuge for its stated objectives. Available parking and size of the facilities will typically limit use at any given time, except during special events.

Conflicts between visitors are localized and are addressed through law enforcement, public education, and continuous review and updating to public use regulations. Conflicts are further reduced by the establishment of seasonal area closures.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the Refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or the purpose for which the Refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE:

LITERATURE CITED:

See CCP Bibliography.

Appendix F



© Kevin Fleming

Delmarva fox squirrel on the refuge

Wilderness Review

WILDERNESS REVIEW AND EVALUATION FOR PRIME HOOK NATIONAL WILDLIFE REFUGE

Introduction

A wilderness review is the inventory, study, and decision making process we use to determine whether to recommend Refuge System lands and waters for wilderness designation. The purpose of a wilderness review is to identify and recommend to Congress lands and waters of the National Wildlife Refuge System (NWRS) that merit inclusion in the National Wilderness Preservation System (NWPS). Wilderness reviews are a required element of comprehensive conservation plans (CCP), and we follow the planning process outlined in 602 FW 1 and 3. This process includes interagency, state and public involvement and NEPA compliance. Natural and Cultural Resources Management Part 610 Wilderness Stewardship chapter 4 Wilderness Review and Evaluation is followed for conducting wilderness reviews.

The wilderness review process consists of three phases:

- (1) **Inventory:** where we identify lands and waters that meet the minimum criteria for wilderness. These areas are called Wilderness Study Areas (WSAs).
- (2) **Study:** where we evaluate WSAs to determine if they are suitable for wilderness designation.
- (3) **Recommendation:** where we use the findings of the study to determine if we will recommend the area for designation as wilderness in the final CCP. We report our wilderness recommendations from the Director through the Secretary of the Interior and the President to Congress in a wilderness study report.

Phase I – Inventory: During the inventory phase, we assess wilderness inventory areas (WIAs) under the minimum criteria for wilderness. The Wilderness Inventory Areas are First Hill, Second Hill, and Negro Island. Refuge lands and waters that meet those criteria are called wilderness study areas (WSAs). During the study phase we evaluate a range of management alternatives to determine whether a WSA is suitable for wilderness designation or for management under an alternate set of goals and objectives that do not involve wilderness designation. If we identify a WSA, we study it further in accordance with CCP process to determine its suitability for wilderness designation. We inventory Refuge System lands and waters to identify areas that meet the definition of wilderness in section 2(c) of the Wilderness Act. The criteria we used to evaluate areas and identify WSAs are:

- (1) Size
- (2) Naturalness
- (3) Opportunities for solitude or primitive recreation
- (4) Supplemental values

(1) **Size:** Section 3(c) of the Wilderness Act directed the Secretary to review every roadless area of 5,000 contiguous acres or more and every roadless island. The size criteria will also be satisfied for areas under Service jurisdiction in the following situations (610 FW 4.8):

- (A) – An area with more than 5,000 contiguous acres (2,000 hectares). State and private land inholdings are not included in making this acreage.
- (B) – A roadless island of any size. A roadless island is a roadless area that is surrounded by permanent waters or that is markedly distinguished from surrounding lands by topographical or ecological features such a precipices, canyons, thickets, or swamps.
- (C) – An Area of less than 5,000 contiguous acres that is of sufficient size to make its preservation and use in an unimpaired condition practicable and is of a size suitable for wilderness management.

- (2) **Naturalness:** we evaluated the naturalness criteria to identify a WSA during the inventory phase of the Wilderness Review as per Service policy 610 FW 4.9 which is premised on Section 2(c) wilderness area definition that “...generally appears to have been affected primarily by the forces of nature with the imprint of man’s work substantially unnoticeable.” To make this determination, it must be possible to observe the area as being generally natural, rather than “pristine.”

Naturalness Evaluation Criteria. Current policy (610 FW 4.9) provides the following guidance for naturalness evaluation:

- (A) –“We make a distinction between an area’s **“apparent naturalness”** and **“historic conditions”** in the context of biological integrity, diversity, and environmental health. The term “historic condition” refers to the condition of the landscape in a particular area before the onset of significant human-caused change. The term “apparent naturalness” refers to whether or not an area looks natural to the average visitor who is not familiar with historic conditions versus human-affected ecosystems in a given area. We have addressed the question of the presence or absence of apparent naturalness (i.e., are the works of humans substantially unnoticeable to the average visitor?)” when considering areas to be included in the inventory phase of our wilderness review.
- (B) –“We avoided an approach of assessing naturalness that limits designation only to those areas judged to be pristine. Land that was once logged, used for agriculture, or otherwise significantly altered by humans is eligible for wilderness designation if it has been restored or is in the process of being restored to a substantially natural appearance”.
- (C) - “We use caution in assessing the effects on naturalness that relatively minor human impacts create. An area being evaluated may include some human impacts provided they are substantially unnoticeable in the unit as a whole. Examples of manmade features that would not disqualify an area for consideration as a WSA include: trails, trail signs, bridges, fire towers, fire breaks, fire suppression facilities, pit toilets, fisheries enhancement facilities (such as fish traps and stream barriers), fire rings, hitching posts, snow gauges, water quantity and quality measuring devices, research monitoring markers and devices, wildlife enhancement facilities, radio repeater sites, air quality monitoring devices, fencing, spring developments, and small reservoirs. Even with these features, an area may express wilderness character and values.”
- (D) -“We may disqualify portions of an area from consideration where significant human-caused hazards make that area unsafe for public use, such as contaminated sites or the existence of unexploded ordnance from military activity. Once these conditions are corrected, we may then consider that portion of the area.”
- (E) -Additional policy guidance suggests that “we do not disqualify areas from further wilderness study solely on the basis of the ‘sights and sounds’ of civilization located outside the areas. Where human impacts are outside the area being inventoried, we do not normally consider them in assessing naturalness. However, if an outside impact of major significance exists, we should note it and evaluate it in the inventory conclusions. Human impacts outside the area should not automatically lead us to conclude that an area lacks wilderness characteristics”.
- (F) -Policy guidance also stipulates that “we do not disqualify areas from further wilderness study solely on the basis of established refuge management activities or refuge uses that require the use of temporary roads, motor vehicles, motorized equipment, motorboats, mechanical transport, landing of aircraft, structures, and installations generally prohibited in designated wilderness. The physical impacts of these practices should be the focus of the naturalness evaluation. We evaluate existing and proposed refuge management activities and uses in the study phase of the wilderness review.”

- (3) **Opportunities for Solitude or Primitive Recreation:** “Section 2(c) of the Wilderness Act defines wilderness as an area that has outstanding opportunities for solitude or a primitive and unconfined type of recreation. An area does not need to have outstanding opportunities for both elements and does not need to have outstanding opportunities on every acre”. (610 FW 4.10) Solitude is defined as “wilderness solitude is a state of mind, a mental freedom that emerges from settings where visitors experience nature essentially free of the reminders of society, its inventions, and conventions. Privacy and isolation are important components, but solitude also is enhanced by the absence of distractions, such as large groups, mechanization, unnatural noise and light, unnecessary managerial presence (such as signs), and other modern artifacts”. Primitive recreation is defined as “activities that provide dispersed, undeveloped recreation and do not generally require permanent facilities.”

The service evaluates outstanding opportunities for solitude or a primitive and unconfined type of recreation based on the following 610 FW 4.10:

- (A) – “The Wilderness Act does not define what was intended by “solitude or a primitive and unconfined type of recreation.” In most cases, we could expect the two opportunities to go hand-in-hand. However, an outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for recreational use that it would be difficult to maintain opportunities for solitude (e.g., around water)”.
 - (B) – “We assess each inventory area on its own merits to determine if an outstanding opportunity exists; we must not compare areas. We may not use any type of rating system or scale, whether numerical, alphabetical, or qualitative (i.e., high-medium-low), in making the assessment”.
 - (C) – “When an area is contiguous to designated wilderness, proposed wilderness, recommended wilderness, a WSA, or other Federal lands that a land management agency has already determined to have wilderness character (i.e., Service, BLM, Park Service, or Forest Service lands), an additional evaluation of outstanding opportunities is not required”.
 - (D) – “An area does not have to be open to public entry and use. Congress has designated several Service wilderness areas that are closed to public use to conserve wildlife and fragile habitats”.
- (4) **Supplemental Values:** The Wilderness Act states that an area of wilderness may contain ecological, geological, or other features of scientific, cultural, symbolic, or educational value. Supplemental values of the area are optional, but the degree to which their presence enhances the area’s suitability for wilderness designation should be considered. The evaluation should be based on an assessment of the estimated abundance or importance of each of the features. Wilderness Values “are biophysical (e.g., ecosystems, scenery, and natural processes), psychological (e.g., opportunity for solitude or primitive recreation), symbolic (e.g., national and natural remnants of American cultural and evolutionary heritage), spiritual (e.g., sense of connection with nature and values beyond one’s self)”.

SUMMARY OF PHASE I WILDERNESS INVENTORY FINDINGS

As part of the CCP planning process we have conducted a wilderness review and Phase I Inventory to evaluate new information and implement new policy of Wilderness Stewardship Guidelines for national wildlife refuges (610 FW 4) issued on November 2008, for a discrete part of the Refuge (cluster of roadless islands located in Management Unit II) that has been identified as having wilderness potential.

The vast majority of the 10,132 acres of Prime Hook NWR was eliminated from consideration because they do not meet the roadless, naturalness, or solitude criteria, based on one or more of the following factors. The imprint of human work is obvious and prominent throughout those areas, which are divided by refuge and state roads, agricultural fields, impoundments, buildings, parking lots, utility right-of-ways, ditches, trails, and levees. This includes existing areas of forest, agriculture lands, impounded wetlands, and salt marshes within Units I, II, III, and IV.

Ongoing refuge management activities include plantings, mowing and managing impoundments. Numerous roads, ditches and levees are present in the forested wetlands. The 10,132 acres also contain developed areas for maintenance, visitor services, and administration, with all their associated parking areas, tour roads, and office and storage facilities. Traffic along state roads is constantly visible or with in hearing of any location within this area. Boat traffic is evident within some of the area as well.

During the preplanning phase of the Refuge's CCP process, the Service contracted the State's Natural Heritage Program to inventory rare plant and animal species and communities and map out Prime Hook's NVCS cover-types. Based on the discovery of several "Legacy Trees" located on inventoried roadless islands in Unit II, these areas may have wilderness potential when considering the context of State's current forested landscape conditions. These areas not only serve as a repository of exceptional large trees but also contain significant ecological, cultural, and scientific value as remnants of eastern North American natural and evolutionary heritage left standing in the State of Delaware.

Ecological Significance of Legacy Trees Today: Prior to pre-European settlement, old growth stands dominated the forested landscape (70-90%) throughout the northeast and east coast providing critical elements of biodiversity and habitat characteristics for many wildlife species that are uncommon and/or endangered today in the State of Delaware. However, old-growth and late successional forests are extremely rare in Delaware as most fragmented forest parcels are secondary growth forest. The only example of old-growth or late-successional remnants remaining, are large, old trees sometimes referred to as "Legacy Trees."

Legacy trees are large (25-30" dbh), old (150+ years) trees that have been spared during previous harvest or have survived stand-replacing natural disturbances (e.g., windstorms, ice and snow storms, insect outbreaks, and disease). Old, large trees are rare today but they were historically a dominant age class in forests of the past. As measured by species richness, diversity, and use by a number of different wildlife taxa, several studies have shown that the retention/conservation of individual legacy trees can have added significant habitat and wilderness values associated with long term biodiversity and managing biological legacies (Mazurek & Zielinski -2004; Hunter & Bond 2001; Bull et al 1997).

Summary of Key Benefits of Individual Legacy trees

- high correlation between legacy tree retention and species richness and diversity, especially for birds;
- adds diversity of tree diameters that provide habitat and cover for a wider range of species compared to younger trees or even-aged stands;
- unique crown architecture & bark morphology provide plentiful micro-niches for lichens, mosses, insects, and nesting perches for migratory birds;
- provide tree elements with basal hollows that support birds, bats, and other mammal species making it possible for many wildlife species to breed where they would not otherwise be able to;
- can serve as "old-growth ambassadors" for public appreciation, experience, and education of ecological significance and beauty of legacy trees and a sense of connection with more ancient

- symbols of nature;
- given scarcity of old-growth or late-successional tree examples and highly fragmented nature of secondary growth in the state, individual legacy trees may function as “mini-reserves” to promote ecosystem function and conservation;
- retain a primeval character and influence on the land serving as historical and natural benchmarks for ecological studies.

Historic and Cultural Significance of Refuge Roadless Islands within Unit II: As part of the CCP pre-planning process, a study and summary of known Refuge historic and prehistoric sites plus an evaluation of archaeological sensitivity in and around Refuge lands was conducted to identify landforms and areas likely to contain undiscovered archaeological resources. Of the wilderness review areas First Hill (PMH-033P)/7S-C-78 has been designated as a prehistoric site.

Prior to allowing Open Marsh and Water Management (OMWM) excavations to occur on the Refuge and as part of the EA for proposed OMWM work, Wise (1988) using prehistoric settlement patterns and wetland sites identified by Custer and Galasso (1983) and Custer (1986) developed a graphic model for paleography and prehistoric site sensitivity at PHNWR. Later, archeologists in 2004 (Tetra-Tech-FW, Inc.) enhanced capabilities of prior explanatory models since the known sites on Refuge were limited (16 prehistoric & 31 historic). Additional known sites within a one mile radius of the Refuge were included to expand model data set to include 25 prehistoric and 53 historic sites. This expanded focus included more wetland sites based on the archaeological monitoring prior to OMWM excavations at PHNWR had led to the identification of several archaeological sites in wetland areas (Clark & Blume, 1990 & 1993).

Qualification of Wilderness Inventory Areas as Wilderness Study Areas (WSAs):

First Hill, Second Hill, and Negro Islands

Conditions Common to all Three Islands

Size Criteria: First Hill (3 acres), Second Hill (5 acres), and Negro Island (2 acres) all meet the size criteria, as the Wilderness Act does not specify a minimum size for roadless islands. The size criteria for areas under Service jurisdiction state that a roadless island can be any size, as long as it fits the definition in 610 FW 1.5 AA:

A roadless island is defined as “a roadless area that is surrounded by permanent waters or that is markedly distinguished from surrounding lands by topographical or ecological features such as precipices, canyons, thickets, or swamps.”

Naturalness Criteria: All three roadless islands do not meet the naturalness criteria where the term “apparent naturalness” is defined as whether or not an area looks natural to the average visitor who is not familiar with the historic condition versus human-affected ecosystems in a given area. The three islands do not meet the naturalness criteria because they are within and altered and managed impoundment. However, there are existing elements of biological integrity, diversity, and environmental health. All three roadless islands are part of the Mesic Coastal Plain Oak Forest community found on the Refuge. These islands are located within isolated wetlands. The islands are dominated by a mixture of loblolly pine, pond pine, and one or more oak species. Understory strata is characterized by American holly, highbush blueberry, swamp doghobble, sweet pepperbush, swamp azalea, and green briar. The herbaceous layer is sparse with rice-cut grass, stout wood reedgrass, slender spikegrass, partridge betty, royal fern and wintergreen. These features enhance the “naturalness” of the areas. However, a road was once used to access these islands. The remnants of this road are still visible today

and can also be seen in aerial photographs taken in the 1930's. The aerial photographs taken in the 1930's also show that there was also an agricultural field on Second Hill. It should also be noted that the surrounding wetlands are artificial. As noted in the vegetation survey, Japanese stilt grass and *Phragmites* are common invasive species to these island habitats.

The unit in which these islands reside is influenced by the artificial water management capabilities developed by the Service. This management unit is bounded on the north by Fowler's Beach Road, barrier dunes on the east facing the Delaware Bay, Prime Hook Road on the south, an upland interface on the west, and a sand dike plus Prime Hook beach community on the east. During storm tides this sand dune system has been breached several times and washouts have deposited sand and salt water into the Unit II impoundment.

Delaware Bay's normal tidal ranges are from 3 to 3.5 feet except for storm surges and spring tides (+ 6.5 ft). Tidal flow enters Slaughter Canal from the Delaware Bay through Unit I salt marshes into the northern portion of Unit II and fresh water flow enters Unit II on the west from Slaughter creek. Since 2009, salt water enters Unit II via the breaches south of Fowler's Beach Road.

General description and background history of Unit II impoundment

Until 1900, Unit II marshes remained unchanged, consisting of a brackish system dominated with cattails and sedges. Prior to the refuge acquiring Unit II, both private land owners and the state mosquito control agency used timber sheeting to construct small water control structures throughout Unit II to manage water levels. Portions of Unit II were also heavily grid ditched during the 1930's for mosquito control. To maintain water on the marsh during the fall and winter for muskrat trapping and waterfowl hunting, private owners built water control structures at Fowler's Beach Road, Oak Island and near the bridge at Slaughter Creek to hold water.

Landowners had the marsh drained and dug Slaughter Canal in the early 1900s to improve drainage of their upland areas by channelizing water north to Cedar Creek. In 1906 the Slaughter Canal dredging reached into Unit II and ended at Oak Island. The construction of Slaughter Canal vastly increased drainage in Unit II marshes and lowered water tables in upland areas and significantly altered tidal exchange, leaving only a narrow band of tidal marsh along the edge of the canal and around Oak Island. The dredging of the canal also contributed to *Phragmites* colonization so that by the 1980s, Unit II had completely reverted to a *Phragmites* jungle, with dense stands covering 1,000 acres (See Prime Hook's Environmental Assessment for Chemical Control of *Phragmites* and Proposed Marsh Rehabilitation- March 21, 1983).

In 1934, a dike was dug by dragline, along the eastern edge of the marsh from Slaughter Beach to Prime Hook Beach to prevent the bay from washing into the marshes. The deep borrow ditch is still evident today but several sections have been filled by washouts. Until the early 1950s, access to Prime Hook Beach was possible only by boat or during the dry summer by horse or vehicle. In 1953, a gravel roadway was constructed across the marsh and today this roadway is paved (Prime Hook Beach Road). It has effectively acted as a dike between Units II and III with culverts under the roadway resulting in some limited flow of water between the units. All of these anthropocentric activities have significantly altered the hydrology of Unit II wetlands (USFWS 1986).

From the establishment of the refuge in 1963 to 1986, Unit II had no water level management capabilities. In 1963, the Service proposed a water management plan which outlined marsh management needs for the entire refuge including Unit II to the public. The plan was designed to

impound refuge marshes without backing water against upland areas. Local residents expressed strong opposition to the proposal and the state Drainage Engineer felt that it had the potential to flood or waterlog contiguous agricultural lands as occurred at Bombay Hook NWR. A revised plan with inland canals to provide drainage of uplands was also strongly opposed. Subsequently, a “No Management” policy was adopted which resulted in a severe decline in the quality, quantity, and productivity of the Unit II marshes over the ensuing years (USFWS 1986). Then in 1987 a large concrete water control structure was put into place. Impounding 1,500 acres this water control structure located on the northern boundary at Fowler Beach Road held back salt water from intrusion into Unit II. After water level management capability was established, salinities within this impoundment range from 0 to 8 ppt year round.

Slaughter Creek was the most significant watercourse in the unit, flowing southeasterly across the entire Unit II to Prime Hook Creek south to Prime Hook Road. Today, the hydrology of Unit II was first changed with the installment of water control infrastructure as water flows northward to Unit I from First and Second Hills to Fowler Beach Road but from Oak Island south, water flows in a southerly direction to Prime Hook Road. With the breaches the salinities can vary from 10 to 30 ppt.

Unit II restoration of water level management in 1987 significantly enhanced the water table of these marshes. Water sources that affect the hydrology of this unit today come from tidal action, runoff from Slaughter Creek, excess water from the Unit III, rainfall and local runoff. Tidal waters have dramatically affected the salinities and extent of open water in Unit II since the breaches occurred.

Opportunities for Solitude or Primitive Recreation: The WIAs identified in the Refuge’s Inventory Phase are discrete roadless islands identified by State Heritage scientists as having wilderness potential based on unique ecological, scientific and historic value. However, the small acreage of the islands does not lend themselves to primitive recreation.

Supplemental Wilderness Values: All three roadless islands possess several supplemental values which include ecological and geological features, archaeological significance, symbolic wilderness value in the form of legacy trees, and unique opportunities for public environmental education and appreciation of exemplary large trees. Examples of unique ecological and geological features on the islands include poorly drained sand makes up the substrate for the community and it also has a very high water table. They also support several examples of “Legacy Trees” unique to the State that include pin oak, willow oak, black walnut, water oak and pond pine tree species. Due to the natural seclusion of these areas, eagle nests have been established on the First and Second Hills, all on exceptionally large loblolly pines. First Hill is an example of an archeological significant area as it is a designated state and federal prehistoric site. Also the scientific, educational and recreational values of the islands could include with special planning, seasonal trips to the islands could provide unique opportunities for the public to enjoy legacy trees, understand their ecological, historic, and provide for scientific research of late successional remnant trees and adjacent habitats.

Land Status and Service Jurisdiction: The Service has full jurisdiction over the lands and waters of these three roadless islands and surrounding wetlands that would ensure maintenance of wilderness resources and character within these potential wilderness study areas and there are no non-federal lands within the WSAs.

Conclusion

The vast majority of the 10,132 acres of Prime Hook NWR was eliminated from consideration to be wilderness because they do not meet the roadless, naturalness, solitude or primitive recreation criteria and the imprint of human work is obvious.

The Service also finds that none of the WIAs in Prime Hook NWR meet the minimum criteria to qualify as a WSA as defined by the Wilderness Act. First Hill, Second Hill, and Negro Island all meet the size criteria, as the Wilderness Act does not specify a minimum size for roadless islands. But, the three islands do not meet the naturalness criteria because they are not primarily affected by nature and the imprint of mans' work is substantially noticeable. The islands reside in a unit influenced by artificial water management developed by the Service. The management of the Unit II impoundment, past and current has had a tremendous impact on the hydrology of the area. These impacts include invasive species intrusion, fluctuating water tables, reduced salinity for several decades and now inundation of former marsh, altered hydrology, and mosquito control to include grid ditching. This area has been heavily manipulated by humans for over a century, and its historic natural appearance (as confirmed by core studies) would have been as an extensive salt marsh system. The islands also do not qualify for opportunities for primitive recreation because of the small acreage of the islands. The last criteria of supplemental values are not required for wilderness, but do exist on the Islands. All three islands possess supplemental values which include ecological and geological features, archaeological significance, symbolic wilderness value and opportunities for environmental education.

None of the Wilderness Inventory Areas meet the minimum criteria to qualify as a Wilderness Study Area so Prime Hook NWR is not considered further for possible designation in its CCP.